DOCUMENT RESUME

ED 055 420 EM 009 267

AUTHOR	West, Leonard J.
TITLE	Effects of Programed vs. Conventional Instruction on Proficiency at Office-Typing Tasks.
INSTITUTION	City Univ. of New York, N.Y. Office of Teacher Education.
SPONS AGENCY	New York City Board of Education, Bronx, N.Y.
REPORT NO	RR-71-8
PUB DATE	Sep 71
NOTE	137p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Business Skills; *Business Subjects; Conventional Instruction; *Intermode Differences; *Programed Instruction; Teaching Methods; *Typewriting

ABSTRACT

Proficiency at vocational typing tasks after conventional or programed instruction was compared. The subjects were low-ability students in first- and second-year typing classes. The programed instruction featured: little practice at ordinary stroking skills, early introduction of vocational typing tasks, explicit instruction in making decisions about attractive placement of materials on the page, and in-class practice on the typewriter in making these decisions. Tests showed that faster typing was produced by conventional instruction. However, for the most consequential criterion of proficiency, form errors, programed instruction was by far the more effective. Also, the level of work quality after one year of programed instruction was far higher than after two years of conventional instruction. Although teachers reported much "live" reteaching of programed placement concepts, its contribution appears modest, judging by comparison of the performances of frequently absent and infrequently absent students. Teachers also estimated student attitudes towards the program as negative and the program not well suited to low-ability traniees. (Author/JK)

ED055420

EFFECTS OF PROGRAMED VS. CONVENTIONAL INSTRUCTION ON PROFICIENCY AT OFFICE-TYPING TASKS

Leonard J. West

EM 009 261

Research Report 71-8
September 1971

Office of Teacher Education
The City University of New York
1411 Broadway
New York, NY 10018

ED055420

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

Research Report 71-8

EFFECTS OF PROGRAMED VS. CONVENTIONAL INSTRUCTION ON PROFICIENCY AT OFFICE-TYPING TASKS

Leonard J. West

Office of Teacher Education
The City University of New York

The research reported herein was performed pursuant to a contract with the Board of Education of New York City: Proposal No. 1, 1969-70, entitled "Implementation and Validation of 'Programed' Curricular Materials for Developing Marketable Typing Skills among Disadvantaged High School Students." The points of view or opinions stated are those of the author and do not, therefore, necessarily represent official Board of Education position or policy.

September 1971

Table of Contents

Page

Table of contents i
List of tables and figures iii
Acknowledgments iv
Abstract v

  Major purpose 2

Related research 2

  Programed materials 4

Procedures 12

  Experimental design 12
  Teachers 16
    Selection 16
    Teaching experience 17
    Rating of teaching skills 17
    Training and supervision of teachers 17
  Subjects 18
    Sample size 20
  Instructional procedures 22
    Conventional vs. programed conditions 22
    Scope of programed and conventional typing curricula 23
    Procedures for student work at the program 25
    Supplementary materials for programed classes 26
    Teacher behaviors 31
  Criterion (and interim) measures 35
    Criterion test items 36
    Test administration conditions 36
    Test scoring 38
  Data analyses 40

Summary of purposes 40

Results and discussion 42

  Vocabulary scores 43
  Role of teacher behaviors in programed instruction 45
    Same vs. different teachers 45
    Live teaching support for programed instruction 48
  Terminal performance--conventional vs. programed instruction . . . 51
    Production typing speed 55
    Form errors in production typing 58
    Overall terminal proficiency of conventional and programed students 58
    Straight copy proficiency 59
    Year-1 vs. year-2 proficiency . . . . .
  Early proficiency following different amounts of practice 63
    Test procedures 63
    Results 64
  Need for teacher supervision of disadvantaged students 69
  Mid-year programed vs. end-of-year conventional performance . . . 70
    Discussion of results 72

Page

Relationships among various kinds of performances 74
Vocabulary and typing performance scores 74
Straight copy and production typing scores 77
Production speed and errors 79
Intertask relationships 80
Judgments of the programed instruction by teachers and chairmen . . 82

Summary of findings, conclusions, and recommendations 87

Findings, conclusions, recommendations 89
Straight copy proficiency 89
Production typing proficiency 90
Role of the teacher in programed instruction 92
Teacher judgments of student attitudes and program features . . . 93
Supervised vs. unsupervised work at programed materials 94
Intelligence and typing proficiency 95
Inter- and intratask relationships 95

References 97

Appendix contents 99

Supplementary table 100
Instructions for program use 101
Teacher questionnaire 103
Criterion (June) test instructions 106
Criterion (June) test materials 107
January test materials 112
December test materials 118
Error scoring manual 124

List of Tables and Figures

(Figure nos. preceded by F)

No. Page

F 1 Sample programed frames 7
1 Experimental design--conventional versus programed instruction 14
2 Teachers' judgments of attitudes and abilities of programed students 19
3 Teachers' estimates of later-life use of typing skills by programed students 20
4 Number of usable subjects under conventional and programed instruction 21
F 2 Sample supplementary materials 28
5 Frequency of student typing tasks during the spring semester . 30
6 Vocabulary scores 43
7 Criterion test statistics of year-1 programed students taught by the same or different teachers 46
8 Criterion test statistics of year-2 programed students taught by the same or different teachers 47
9 Range and mean for days absent (spring semester) at selected percentiles 48
10 Criterion test statistics for the P_{75} and P_{25} absentees 49
11 Criterion test statistics of year-1 conventional and programed students 52
12 Criterion test statistics of year-2 conventional and programed students 53
13 Criterion test means and significance tests for year-1 and year-2 conventional and programed students 54
14 Production speeds (wpm) of year-1 and year-2 conventional and programed students 57
15 Differences between year-1 and year-2 speed means 60
16 Differences between year-1 and year-2 error means 60
17 Test statistics of year-2 homework and in-class programed students 65
18 Test statistics of year-1 homework and in-class programed students 66
19 Percentage of homework and in-class attendees who completed each production task 67
20 Means and significance tests for year-1 and year-2 programed students in homework and in-class classes 68
21 Performance means on mid-year programed and end-of-year conventional testing 71

No.		Page
22	Correlations between vocabulary and production typing scores	75
23	Correlations between straight copy and production typing scores . .	77
24	Correlations between production speed and errors	79
25	Median intercorrelations among production tasks	80
26	Criterion test means of individual teachers	100

Acknowledgments

My greatest debt is owed to the hard-working participating teachers and chairmen in the Secretarial Studies Departments of the two vocational high schools in New York City in which the present research was conducted (Central Commercial and Grace Dodge). To the chairmen, Mr. Goodwin Gilson and Mr. Jack Grossman, and especially to the teachers--Mr. David Baer, Mrs. Elizabeth English, Miss Irene Ferguson, Mrs. Zelda Unger, Mrs. Deborah Williams, and Mrs. Loretta Wolf--I express my deep appreciation. A number of other high school staff members were involved in a portion of the instruction, and to them I am also grateful. They are: Miss Jacqueline Combs, Mrs. Pearl Gershenhorn, Mrs. Dorothy Haydon (Chairman), Mrs. Barbara Kapitansky, Miss Frances Mishkind, Miss Aleida Morales, Mrs. Rita Saunders, Mrs. Terry Shenkman, and Mrs. Beverly Trauring.

My research assistant, Mrs. Francine Moskowitz, skillfully aided me in every aspect of the work throughout the instructional year. Professor Alan L. Gross, of the Center for Advanced Study in Education of The City University of New York, recommended the modes of data analysis, and the computer program for the analyses was developed by Mrs. Wen-Huey Su. Professor Max Weiner, of the University's Center for Advanced Study in Education and Office of Teacher Education, read this report in draft form and made a number of helpful suggestions.

Finally, I am grateful to Mr. Norman W. Elliott, Acting Director of the Bureau of Business and Distributive Education in the Board of Education of New York City, for arranging for funding of this investigation and for helping to arrange for the participation of high school staff members.

LJW

Abstract

Among low-ability Ss (students) in first- and second-year typing classes in two vocational high schools, proficiency at vocational typing tasks following conventional instruction (N = 45 Year-1 and 168 Year-2 Ss in the classes of two Year-1 and four Year-2 teachers) was contrasted with proficiency following programed instruction (N = 109 Year-1 and 225 Year-2 Ss in other classes of the same teachers in the same schools). The leading features of the programed instruction were the reverse of conventional ones and consisted of: (a) little practice at ordinary stroking skills, (b) very early introduction of vocational typing tasks, (c) explicit instruction in making decisions about attractive placement of materials on the page--via programed homework, and (d) in-class practice at the typewriter in applying placement decisions to the typing of business letters, tables, and manuscripts embracing a wide range of internal task features and task difficulty (from unarranged, often longhand materials) without teacher guidance. The programed instruction was identical in scope for Year-1 and Year-2 Ss and was conducted for a full school year.

Ss were tested on representative vocational typing tasks, scored for speed, form errors (ones in placement of materials on the page), and for uncorrected typographical errors; straight copy performance was scored for speed and errors. Of 11 terminal vocational task comparisons (conventional vs. programed) across both years, there were 4 significant speed differences, favoring conventional Ss, who were 27% faster (Year 1) and 12½% faster (Year 2) than programed Ss. For the most consequential criterion of proficiency, form errors, all 11 comparisons significantly favored programed Ss, whose total errors were about half those of conventional Ss (38.42 vs. 74.11 for Years 1 and 2 together). Indeed, for parallel test items, mid-year proficiency among programed Ss (for form errors) was greatly superior to end-of-year proficiency among conventional Ss. Further, the level of work quality following one year of programed instruction was greatly superior to that following two years of conventional instruction--for a 1-year programed curriculum exceeding in scope that of 2-year conventional instruction. Nothing of consequence was found for uncorrected typographical errors, and no significant differences were found in terminal straight copy proficiency. Modification of training practices in the direction of the instructional features enumerated above is strongly indicated.

Teachers reported much "live" reteaching of programed placement concepts; but its contribution appears to have been modest in view of the finding of no terminal performance differences between frequently absent and infrequently absent programed Ss. Teachers also estimated student attitudes toward the program to be substantially negative and the program not well suited to low-ability trainees. However, typing proficiency following the programed instruction shows these motivational features to have been transcended by the more important instructional variables enumerated above.

EFFECTS OF PROGRAMED VS. CONVENTIONAL INSTRUCTION ON PROFICIENCY AT OFFICE-TYPING TASKS

The general problem to which the present investigation was addressed is the undersupply of typists sufficiently skilled at vocational typing tasks. As given in government reports (e.g., Wright, 1964), employers' complaints of shortages of, and insufficient skills among, typists have been chronic. The numbers and proportions of office workers who operate a typewriter (clerks, typists, stenographers, secretaries) have been steadily increasing, and further increases have been predicted (U.S. Bureau of Labor Statistics, 1963; New York State Education Department, 1970). In particular, the U.S. Department of Labor's Occupational Outlook Handbook (1966-67 edition) has pointed to a special need during the 1970's for "senior" typists, who "generally perform work requiring . . . independent judgment; they may work from rough drafts . . . which contain technical material, or they may plan and type complicated statistical tables . . . ." Especially compelling is the need to furnish an occupational skill to the disadvantaged urban student, numbers of whom presently complete "clerical" training with little more than ordinary copying skill.

The available research evidence (see "Related Research") suggests that the problems or needs mentioned above arise from deficiencies in conventional instructional materials and practices. Chief among these deficiencies appears to be instruction in the decisions and processes that govern attractive "placement" or arrangement of typed materials on the page, according to established conventions. As a first step in attempting to remedy these deficiencies, instructional materials bearing on the placement features of realistic typing tasks (business letters, tables, and manuscripts) were prepared in "programed" form (West, 1970), in readiness for field trial among high school students enrolled in first-year and second-year typing courses. Following completion of a given subsection of the programed materials, the learner then applies to the actual typing of pertinent tasks the placement concepts and procedures taught by the program. Although the programed materials were intended for use among any (high school and college) trainees, funds for assessing the effects of the materials were available only for field trial among disadvantaged trainees.[1]

---

[1] The present investigation was carried out under New York City Board of

Major Purpose. The major purpose of the present investigation was to assess the relative effects of programed versus conventional instruction on proficiency at three major classes of vocational typing tasks (business letters, tables, manuscripts), among students in 1st-year and 2d-year typing classes. More exactly, as will later be explained, the contrast was between the effects of "live" instruction and the effects of an amalgam of live plus programed instruction, using the same teachers under both instructional conditions. Particular programed materials and particular teachers were involved. No general test of live versus programed instruction was intended; for no such test could have any conceivable scientific validity. Instead, should significant superiority in proficiency follow the instruction involving the programed materials, the general use of the materials in training could contribute to alleviating labor shortages, reducing complaints about insufficient skills among typists, and furnishing a marketable skill to students whose present training has been less than adequate.

Several ancillary purposes are more readily explicable after the procedures of this investigation are described. Accordingly, all purposes are listed in detail following the "Procedures" section (pp. 40-42).

Related Research

The research evidence in support of the deficiencies of conventional instruction and of the mistaken rationale underlying it has been given in detail elsewhere (West, 1969, Chap. 13) and was summarized in the report of the preparation of the programed materials used in the present study (West, 1970); accordingly, it is given briefly, rather than in detail, here.

The primary fallacy in the rationale underlying conventional instruction is the assumption that ordinary stroking or copying skills are a major contributor to proficiency at vocational typing tasks. That assumption is implicit in the amount of attention given to copying skills in typewriting textbooks and in the volume of reported data on speed and errors in ordinary copying tests--in contrast to the virtual absence of data on proficiency at vocational typing tasks. Ordinary stroking or copying skills are measured in "straight copy" tests involving the line-for-line copying of perfectly printed

---

Education Proposal No. 1, 1969-70, entitled: "Implementation and Validation of 'Programed' Curricular Materials for Developing Marketable Typing Skills Among Disadvantaged High School Students."

prose, without error correction, and requiring no placement decisions other than reasonably regular right-hand margins and, sometimes, correct word division. In contrast, realistic typing tasks contain components and impose requirements wholly absent in straight copy typing, viz., knowledge of conventions of format, decision-making about placement of materials on the page (e.g., margins, tabular stops for table columns), heavier use of the typewriter's service mechanisms, proofreading, and error correction.

The unique features of vocational typing tasks should lead one to expect correlations between straight copy and vocational typing skills that are, at best, moderate. The evidence supports that expectation. Specifically: for errors, near-zero correlations have been found between straight copy and vocational typing (both under no-erasing conditions); for speed, moderate correlations have been found among advanced typists who have established mastery over the placement features of vocational tasks (West, 1969, Chap. 13), while somewhat lower ones have been found among novices (McLean, 1971). Thus the conventional assumption that ordinary copying skills contribute appreciably to skill at vocational typing tasks is seriously in error.

Another type of evidence supporting the low relevance of copying to vocational typing skills is the enormous differences in proficiency scores between the two types of tasks. Speed at vocational typing tasks is a small fraction of ordinary copying speed; stroking errors are also appreciably fewer in vocational tasks--under no-erasing conditions (West, 1969, Chap. 13). Apparently, the typist's "set" or perception of the requirements of the two kinds of tasks differs; accordingly, so do his stroking habits.

Muhich's (1967) study, summarized by West (1969, Chap. 13), is the only one directly addressed to estimating the relative roles of stroking skill and of decision-making about placement of materials on the page in total proficiency at realistic typing tasks. She found decision-making to play a larger role than stroking skill, increasingly so, as amount of training increased. That evidence, together with the evidence mentioned earlier, strongly suggests that the heart of proficiency at realistic typing tasks is decision-making about arrangement of materials on the page.

The evidence, however, seems not to be well known among practitioners, and the contents of typewriting textbooks are not in good accord with that evidence. For one thing, instruction in vocational tasks tends to be deferred until relatively late stages of training. For another thing, although typewriting textbooks contain ample materials to be typed, such materials are typically accompanied by explicit placement instructions, even at relatively late stages of training. It is difficult to imagine any employer instructing his typist to "type this 137-word letter" or to "leave 8 spaces between columns in this table"; yet guidance at that level pervades the typewriting textbooks. The textbooks contain placement "rules," sometimes in list form, but no explicit practice at the sequential decisions represented by the briefly stated rules. To judge from the levels of proficiency at vocational typing tasks following conventional instruction, the supporting or additional instruction furnished by teachers has not been notably successful in remedying textbook omissions and, thereby, in producing marketable vocational typing skills among students.

The evidence points strongly to the preeminence of decision making about arrangement or placement of materials on the page in accounting for skill at vocational typing tasks. The discrepancy between the implications of that evidence and conventional instructional materials and practices led to the preparation of instructional materials directly addressed to the "mental" decisions governing the placement features of three major classes of vocational typing tasks (West, 1970), as described next.

Programed Materials. The sequential, step-by-step character of the pertinent decision processes lends itself especially well to the step-by-step sequencing of instruction that characterizes "programed" instruction. Accordingly, the instructional materials were prepared in programed form and consisted of 541 linear "frames" organized into 14 sections, as follows:

Section	Topic	No. of Frames
1	Centering at the typewriter	19
2	Horizontal centering of single lines	46
3	Vertical centering	34
4	Vertical centering of simple tables	37
5	Tables without column headings (backspace method)	40
6	Tables with column headings (backspace method)	26
7	Tables without column headings (arithmetic method)	22
8	Tables with column headings (arithmetic method)	31
9	Advanced table typing	105
10	Vertical margins for business letters	34

Section	Topic	No. of Frames
11	Horizontal margins for business letters	22
12	Advanced business letters	40
13	Estimation of copy length and centering of estimated materials	45
14	Manuscript and report typing	40
		541

The scope of the program is evident from its table of contents, above. The first three sections deal with elementary matters that are prerequisite to the vocational tasks specified in Sections 4-14. Simple centering (Sections 1-3) tends to be adequately treated in conventional instruction; programed materials were prepared on that topic merely to provide an easy introduction to programed instruction for students who had not earlier experienced instructional materials in programed form. The more consequential "decision-making" sections (4-14) constitute the heart of the program and were deliberately organized to provide maximum flexibility of use in keeping with variations in training syllabi, objectives, and duration. Except that "advanced" sections (9, 12) require earlier study of the corresponding simpler sections (5-6 and/or 7-8, 10-11), the sections of the program are essentially independent and may be used in a variety of orders. As shown by the program's contents, table planning may be taught by either of two methods or by both methods, as the teacher may desire. The teacher may elect to assign either of two methods of dateline placement in business letters (Section 10): (a) "moving"--dateline location varies with letter length and distance between date and inside address is fixed; (b) "fixed"--dateline constant and distance between date and inside address varies with length of letter. In all program sections, there is provision for both pica and elite type; in applicable instances the student selects a route through the program corresponding to his size of type. The particular placement procedures taught in the program are not tied to any particular typewriting textbook; they represent a selection by the author, according to his judgment, of optimal procedures--sometimes ones not represented in any typewriting textbook. Finally, and not least in importance, the placement processes taught in the program aim at to-the-line and to-the-space exactness in placement--not approximations. The contention underlying that deliberate tactic is that it is no more difficult to be just right as approximately right; besides, the labor market requirement for "senior" typists connotes a need for high-quality, precision work.

To illustrate the student's use of the program and its place in instruction, six sample frames from the section on "Vertical Placement of Business Letters" ("moving" date line) are shown on pages 7-8.[2] The first ten frames in that section are not shown; frames 11-15 are a sequence; the illustration then jumps to the final "test" frame in that section (No. 34). As illustrated, the learner reads the frame, fills in the blanks (multiple choice items are given in parentheses below the blank), then checks his responses against the model answers given at the left of the following frame. Occasionally, explanations of answers are given in square brackets following the answer. It is _not_ required that a typewriter be available during work at the program. Instead, the program deals entirely with the "mental" processes or steps in determining placement of materials on the page, accompanied by specification of the physical operations required for implementing the placement decisions at the typewriter. Following completion of a portion of the program, the learner then uses the typewriter to apply the placement processes taught in the program to (a) the many miniature tasks included in the program and/or to (b) pertinent typewriting-textbook or locally prepared business letters, tables, and manuscripts. To that end, each of the fourteen sections is further divided into subsections, each of which is judged to provide a single work assignment of practicable duration (10-30 minutes) and meaningful scope.

The scope of the program manifestly exceeds a single semester's work, and its flexible organization permits distributing its subsections across two or three or four semesters, as may be desired. In the present investigation, as described in the "Procedures" section, the entire program was to be "covered" within the two semesters of first-year typing classes and, minus several of the elementary sections, in the two semesters of the separate second-year typing classes, as well. While the scope of the entire program extends well beyond what is characteristically taught in first-year typing classes (e.g., tables with braced column headings), it is contended, for one thing, that the one-year courses that predominate (70 percent of all typing instruc-

---

[2] Six sample frames from a section on table planning are on pages 9-10.

Figure 1. Sample Programed Frames

NOTE: The 6 frames on pages 7 and 8 are from a section on "Vertical Placement of Business Letters"

10-11

There is a simple rule that tells you how many lines from the top edge to type the date. The location of the date depends on the number of __________ in the ______________ of the letter. Here's the rule.

RULE: For a letter of up to 60 words, put the date on line 22. For each additional 20 words or fraction of 20 words, raise the date 1 line.

If words = 60 or less, date line = 22. For 61 to 80 words, the date goes up 1 line to line 21. For 81-100 words, go up another line to line ____; for 101-120 words, place the date on line ____, and so on.

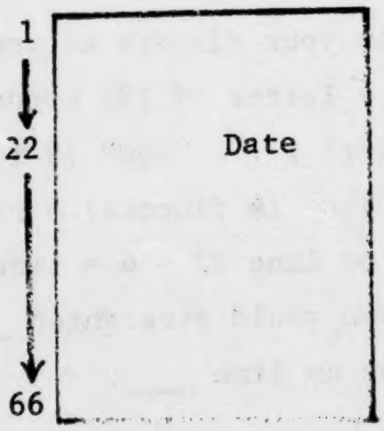
words

body (or message)

20

19

10-12



For a letter of 60 words or less in the message, the distance from the top of the page to the date is ____ lines. The date is ____________ (raised/lowered) 1 line for each additional ____ words or fraction of ____ words.

22

raised

20

20

10-13

For a letter of longer than 60 words, we want to know how many lines above line 22 to type the date. We want to know how many lines to ________________ (add to/subtract from) line 22.

subtract from

10-14

Assume a letter whose message contains 96 words. To locate its date line, count on your fingers. Count by 20's, starting at 60, until you pass 96. Start with a closed fist and straighten a finger for each 20, like this: "60" . . . "80" (1 finger) . . . "100" (2 fingers). Subtract the number of straightened fingers from the line number on which a letter of up to 60 words is placed; that is, subtract from ____. For the 96-word letter, the date would be on line ____ - 2 = ____.

22

22 (- 2) = 20

10-15

Count on your fingers as you read this frame. Assume a letter of 138 words. Count: "60" . . . "80" (1 finger) . . . "100" (2 fingers) . . . "120" (3 fingers) . . . "140" (4 fingers). Place the date for that 138-word letter on line 22 - 4 = line ____. For a letter of 103 words you would straighten ____ fingers, and its date would be on line ____.

[Note: 18 additional practice frames follow.]

18

3

19 [22 - 3]

10-34

Now a little TEST.

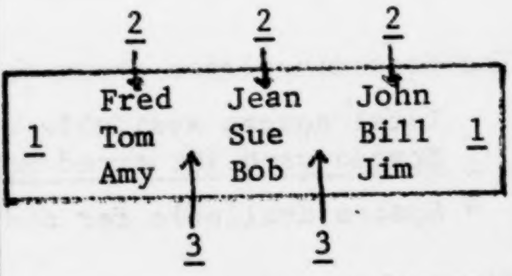
1. For a letter of up to ____ words, place the date on line ____.
2. In a letter of 116 words, the date should be placed on line ____.

Answers to frame 10-34

1. 60
   22
2. 19 [22 - 3]

NOTE. The 6 frames on pages 9 and 10 are from a section on "Tables without Column Headings (Arithmetic Method)."

7-2



Horizontally, the body of a table has three elements or parts. As numbered at the left, they are: 1 side margins (left and right), 2 typed matter, and 3 IC (intercolumn) space--the blank space between columns.

If the planning of a table is correct, then: side margins + typed matter + IC (intercolumn) space should equal total spaces across the page.

On 8½" x 11" paper or stationery, in pica type there are ____ spaces across the page; in elite type, ____ spaces.

If some elite table uses 50 spaces for the typed matter + ICs, there will be ____ spaces left for the ______________ ______________.

85

102

52 [102 - 50]

side margins
(or left and right margins)

7-3

To plan a table means to locate the LM (left margin) and the starting point for each column. To do that, you must first determine the number of spaces needed for the typed matter. So: identify the longest item in each column, count its spaces, and add across the columns. Consider:

California	Sacramento	15,707,204
North Dakota	Bismarck	632,446
Ohio	Columbus	9,706,397

The longest item in column 1 is ______________________; it has ____ spaces. In column 2, the longest item has ____ spaces; and in column 3, ____ spaces. The total is ____ spaces.

North Dakota

12

10

12

32

7-4

To plan tables by arithmetic, you use a horizontal line to represent each column, and you show the number of spaces in each column and between columns, like this:

___20___ 6 ___10___ 6 ___10___

The sketch shows that typed matter = 20 + 10 + 10 = ____

ICs (intercolumns) = 2 x 6 = ____

Total = ____

In elite type, the space remaining for side margins would be 102 - ____ = ____.

40
12
52
(102 -) 52 = 50

7-5

The preceding frame shows that:

- Total spaces available across the page
Spaces used for typed matter and ICs (intercolumns)
= Spaces available for side margins

Since there are two side margins, just divide the marginal space by ___ to determine the point on the carriage scale at which to set the _______ margin. Example: 40 spaces of typed matter + three 5-space ICs total ____ spaces. In pica type, the space remaining for the two side margins = ____ spaces, and the LM (left margin) would be set at ____.

[Note: four additional practice frames follow.]

2
left
55 [40 + 15]
30 [85 - 55]
15 [½ of 30]

7-10

Use scrap paper for the arithmetic and fill in the blanks. When an odd number of spaces remains for side margins, put the "larger half" in the __________ (left/right) margin.

	Column Spaces	In Each IC	Left Margin Pica	Left Margin Elite
Example	8-12-6-20	5	12	21
a.	18-23	9	____	____
b.	6-9-13-7-10-4	3	____	____
c.	7-19-12	7	____	____
d.	18-8-11-4	6	____	____

left

Note. The diagonal or fraction bar (/) is also a division sign. 12/2 means 12 ÷ 2.

Ex [85-(46+15)]/2=12 pica
[102-(46+15)]/2=21 elite

a [85-(41+9)]/2 =18 pica
[102-(41+9)]/2=26 elite

b [85-(49+15)]/2 =11 pica
[102-(49+15)]/2=19 elite

c [85-(38+14)]/2 =17 pica
[102-(38+14)]/2=25 elite

d [85-(41+18)]/2 =13 pica
[102-(41+18)]/2=22 elite

7-11

With arithmetic planning, it is easy to check your work before typing. Once you have figured out LM and RM, just sum across (margins + typed matter + ICs). If you do not get a total of ____ (pica) or ____ (elite), you know you have made an arithmetic error and can recheck. Fill in the

	LM					RM		Total
Pica	19	16	9	23		18	=	____
Elite	25	7	7	17	7 12	24	=	____

There is a mistake in the __________ (pica/elite) example. The margins should be ____ (left) and ____ (right).

[This frame makes a convenient stopping point.]

tion in this country, according to Wright, 1964) mandate inclusion, in such courses, of all the major typewriting tasks required for marketable skills. For another thing, the low relevance of ordinary copying skills to proficiency at realistic typing tasks, in the light of the demands of the decision-making features of such tasks, argues for the introduction of such tasks earlier in training than has been typical. Hopefully, the introduction of such tasks early in first-year training and the particular focus on the consequential decision processes of such tasks permit covering a wider range of tasks and task difficulty than would otherwise be possible within first-year training.

Insofar as "programed instruction" is, by definition, self-instruction, work on it should in theory be done by the student outside of class (e.g., as homework). So used, the program takes over the teaching of placement processes that otherwise characteristically requires much of the teacher's time, thereby providing much more class time for actual typewriting. Whether the program can indeed be used in ideal "homework" fashion or, instead, must be worked on in class under the teacher's supervision, depends mainly on the appropriateness of the program's content to given learners and in part on the attitudes of given students toward school in general and toward homework in particular, as well as on the skill of teachers in accommodating their "live" instruction to the programing of portions of the instruction. Although students work at their own individual rates on programed materials, the dividing of the present program into many short subsections permits the assignment of a given subsection to all students in a class (as homework), in consequence allowing actual typewriting practice in class the next day on a common body of materials for actual typing. The mode of use of the program in the present investigation, with regard to in-class versus at-home work on the program and other issues, is described in the "Procedures" section (pp. 22-35).

It may be repeated that the dominating considerations accounting for preparation of the program were (a) the inferred inadequacies of conventional materials and practices relating to the "placement" features of the major vocational typing tasks and (b) the nice correspondence between the step-by-step sequencing of "programed" instruction with the step-by-step, sequential nature of the decision processes that govern placement of typed materials on the page. The explicit research findings supporting the first of the above-mentioned two considerations and the processes of program preparation are described in an earlier report (West, 1970) containing the full program.

Procedures

Treated in turn are: (a) experimental design, (b) teachers, (c) subjects, (d) instructional procedures, (e) criterion (and interim) measures, and (f) modes of data analysis. Finally, the purposes of the present investigation are listed in more detail.

Experimental Design

The two contrasted instructional methods or treatments or conditions are: C (conventional) and P (programed) instruction. The proficiency scores of C students were drawn from an earlier study (McLean, 1971) devoted to the development of indices of difficulty for vocational typing tasks. To hold constant teaching skill and the kinds of students undergoing C and P instruction, in several of the high schools involved in the earlier McLean investigation arrangements were made for several of the same teachers to participate, two years later, in the trial of the programed materials, using classes at the same typing grade levels as those of the earlier conventional instruction and, of course, the same criterion measures. It was assumed that within a two-year period any school would tend to have comparable students. As a modest check on that assumption, a brief measure of general ability, administered to the C students by McLean in his investigation, was also administered by the present investigator to the P students [see "Criterion (and Interim) Measures," pp. 35-40].

Initially, for the trial of the programed materials, arrangements were made for the participation of three of the schools that had been involved in the earlier McLean study and of certain of the same teachers in those schools. With each teacher assigned a pair of typing classes at the same typing grade level as in the McLean study,[3] there were originally six teachers of first-year classes and six teachers of second-year classes: in School A, four Year-1 and four Year-2 teachers; in School B, two Year-2 teachers; and in School C, two Year-1 teachers. However, because of school-wide disruption in School C, leading to closing of the school on a substantial number of days, conduct of the investigation in that school had to be discontinued after the first semester of the school year. Since the outcomes of this study were to be measured upon completion of a full school year, School C was entirely dropped from this study.

---

[3] In School B it was possible to assign three typing classes to one of the two teachers.

Further modification of the original orthogonal design (equal number of teachers and classes at each typing grade level) was necessitated by the inability of School A to meet the original commitment to program intact classes with the same teacher during both semesters of the school year allocated to the programed instruction.[4, 5] In that school, some students in some first-semester (fall) classes remained with the same teacher during the second (spring) semester; other students taught by various fall-term teachers were distributed among the classes of different teachers during the spring term. The present study retained only those P students whose spring-term teachers had been involved in fall-term instruction in P classes.

However--and despite the absence of information on the extent of yearlong stability of teachers of C students (see Footnote 5, below)--the teacher shifts among P students in School A provided an opportunity to test the possible effects on criterion performance of "same vs. different" teachers during the school year. On the thesis that the typing curriculum is markedly cumulative (simple tasks are necessarily embedded in later, more difficult, tasks)--with the programed materials being deliberately cumulative--it might be contended that criterion proficiency is influenced mainly by one's most recent (spring-term) teacher. The hypothesis would then be one of no differences in terminal proficiency among those taught by the same or by different teachers during the school year. On the other hand, differences in teaching skill could outweigh the stabilizing effects of the cumulative nature of the typing curriculum--leading to a hypothesis of differences in terminal proficiency accompanying differences in teachers. These hypotheses

---

[4] One substitute teacher lost her position in the spring; others took maternity leaves or were transferred to other assignments.

[5] The C students of the McLean study had been taught, variously, by the same or by two different teachers during the two semesters of the school year preceding their criterion testing. McLean did not inquire into and therefore did not report the numbers of students in each of the two categories. However, the novelty (to teachers) of programed instruction made it desirable to keep students with the same teacher throughout the year.

were tested in the present investigation, as a first step, and the results used to determine whether the eventual comparison of P with C students was to be carried out separately for same-teacher and for different-teacher P students or, alternatively, for all P students taken together.

In School A, in order not to "lose" students despite attrition among teachers between the fall and spring semesters, it was possible to assign to the two retained Year-2 teachers three typing classes in the spring, thus salvaging many students whose fall-term teachers did not continue into spring instruction. Unfortunately, it was not possible to increase from two to three the number of typing classes of the retained Year-1 teachers; it was necessary to discard the many fall-term students in Year-1 whose spring-term teachers had not participated in the earlier McLean research--teachers for whom there were no scores for C students. In School B there was neither attrition among teachers nor shifts of students from one teacher to the other. In that school, each teacher had three spring-term classes.

In summary, the programed instruction involved the performance of students in four Year-1 classes of two teachers and in 12 Year-2 classes of four teachers. The experimental design (for C vs. P instruction) is summarized in Table 1, showing the number of spring-term typing classes of the various teachers under the C(onventional) instruction of the earlier McLean study and under the P(rogramed) instruction of the same teachers in the same schools two years later.

Table 1
Experimental Design--Conventional vs. Programed Instruction
(Number of Spring Typing Classes)

School and Teacher	Year 1		Year 2	
	Conv.	Prog.	Conv.	Prog.
School A				
Teacher A	1	2		
B	2	2		
C			2	3
D			2	3
School B				
Teacher E			2	3
F			3	3
Total	3	4	9	12

As displayed in Table 1, the data for the major purpose of the present investigation were provided by Year-1 students in 3 conventional and 4 programed classes and by Year-2 students in 9 conventional and 12 programed classes, with the same spring-term teachers for both types of instruction.

The original proviso of a pair of programed classes for each teacher was intended to furnish the largest possible number of students in the light of reasonable scheduling of teachers. However, that proviso permitted the test of an additional hypothesis that arose from the views of the participating teachers and department chairmen prior to initiation of the programed instruction, based on the type of students in the particpating schools. The two participating schools are vocational high schools with substantial proportions of so-called disadvantaged students, of presumed below-average ability and, conceivably, of less than "strong" motivations toward school. The "programed" instructional materials make demands on reading (and, on some topics, arithmetic) skills. Teachers and chairmen contended that students would have difficulty in learning from written materials, that they would not work conscientiously at the materials unless under the direct supervision of their teacher, and that there would be resentment of homework for an "unprepared" (i.e., no homework) subject like typewriting. Although the attempt was made during preparation of the programed materials to gear its reading difficulty to low-ability students (see West, 1970), to assess the validity of the assumptions about these students, one of the two (or three) P classes of each teacher was randomly assigned to in-class work at the programed materials; the other(s), to "home" work at the program. The investigator pointed out to teachers and chairmen that the self-paced character of programed instruction would make in-class work on the program unmanageable and, moreover, that little class time would be left for actual typing were it to be largely preempted by work at the program. Within a few weeks of the mid-October initiation of at-home versus in-class work at the programed sections, reports of the teachers confirmed the investigator's predictions. However, to provide at least a modest test of the original assumptions it was agreed to continue with the dual work conditions until the Christmas holidays, shifting all classes immediately thereafter (in January) to "home" work at the program. As a basis for testing the hypothesis about the behavior of disadvantaged students with regard to programed materials, there was, then, a 2-month period at the beginning of first-year and second-year instruction carried out under differential homework and in-class conditions, with results based on scores on a brief test battery administered to students just before the Christmas holidays. For that purpose there was a sufficient number of students in the classes of teachers who continued with P classes in the spring term to permit discarding of classes (in School A) whose teachers did not continue with spring-term programed instruction, leaving 122 homework and 133 in-class *Ss* in the 13 fall classes of 6 teachers.

Finally, a test battery was administered to all P students at the end of their first (fall) semester of instruction (late January), for several reasons: (1) to provide an estimate of mid-year proficiency, (2) to provide a basis for comparing the results of mid-year P instruction with end-of-year C instruction--in the light of the coverage in first-semester P instruction of topics treated at the end of the school year in C instruction (in Year-1 classes), and (3) to salvage the scores of students who were transferred to spring-term classes of teachers who had not been involved in C instruction.

Teachers

Described, in turn, are: (a) the selection of participating schools and teachers, (b) the extent and nature of the teaching experience of participants, (c) ratings of their teaching skills, and (d) the training and supervision of teachers for the conduct of programed instruction.

Selection. The requirement in a comparison of instructional methods that teachers be held constant mandated the use of teachers in the field trial of the programed materials who had also been involved in the conventional instruction of the earlier McLean investigation (1971). That earlier investigation required the cooperation of schools only to the extent of providing one full school week for massive testing of students, rigorously administered by the investigator and his assistants. Accordingly, a large proportion of each school's staff with typing classes at the desired grade levels agreed to participate, representing, presumably, a range of teaching skills. Solicitation of these schools' participation in the more massive, full-school-year intervention needed for trial of the programed instruction led to acceptance by three high schools, i.e., of a number of teachers in these schools who had been involved in the earlier conventional instruction and whose chairmen committed them to at least two typing classes at the appropriate grade level during the year of programed field trial. The investigator's impression of the initial attitudes of teachers toward participation was enthusiasm among some, curiosity (about programed instruction) among others, and neutrality among still others.

Teaching Experience. As explained earlier, one school had to be dropped following the first semester of P instruction. Of the ten teachers in the other two schools who began the year of P instruction, one was a substitute teacher teaching out-of-license; the typewriting teaching experience of the others ranged from several to many years. All six (of the original ten) teachers who completed the full year of P instruction were experienced. None of the participants, however, had any earlier experience with programed instruction or more than superficial knowledge of the characteristics of such instruction. They may be characterized as experienced in teaching typewriting, but novices at programed instruction.

Rating of Teaching Skills. Of the six teachers whose commitment to programed instruction for the entire school year was met, one was rated by the department chairman as a "superior" teacher, three were rated as "average," and two were rated as "below average" in teaching skills by their chairmen. The investigator's subjective judgment of these six teachers, upon early visit to their classes, concurred in every instance with that of the department chairmen. In a teacher questionnaire completed by participating teachers at the end of the year of programed instruction (see p. 105, item 15), five of the six teachers rated their own teaching skills as "average"; one "excellent" self-rating was by a teacher who was considered "average" by the department chairman and the investigator. It appears from these various ratings that participating teachers represented a range of teaching skills perhaps not unlike that of teachers in general.

Training and Supervision of Teachers. Neither funding nor the schedules of teachers permitted in-depth training for the novelties of programed instruction that would ideally have been desirable. Instead, the investigator conducted a 3-hour Saturday morning session with participants prior to the beginning of P instruction and visited the classes of each teacher at least once early in the fall semester--as did department chairmen later in the year. In addition, by arrangement with chairmen the investigator conducted instruction in each of several classes on one occasion, with teaching assignments on that day shuffled to permit all participants to observe the investigator's instruction in at least one class. A second 3-hour Saturday session was held with participants at mid-year, just before the beginning of spring-term instruction. Throughout the school year--beginning with a 9-page single-spaced teachers' manual dealing with the management and scheduling of instruction--teachers were sent by mailed memo and letter a steady stream of detailed advice and instructions, as well as ample supplies of practice and test materials for use in class immediately upon completion of each of the 48 subsections into which the program was divided. These were materials of a kind unfortunately not frequently found in published typewriting textbooks (viz., unarranged materials requiring the typist to make all the placement decisions). The investigator was also in periodic telephone contact with teachers and chairmen.

Details on the extent to which teacher behaviors were in accord with ideal specifications are given in the "Procedures" subsection entitled "Teacher Behaviors" (pp. 31-35).

Subjects

The students or subjects (Ss) were high school trainees normally enrolled in first-year and second-year typing classes in two vocational high schools serving a largely disadvantaged student body. Assignment of Ss to classes followed the school's ordinary programming procedures and led, presumably, to Ss being a representative sample of all typing students in the school. Some Year-1 classes (in School A) included stenographic majors, typically somewhat more able than the "clerical" majors of other Year-1 classes in that school scheduled for a 2-year typing program. All Year-2 classes in both schools consisted of clerical majors.

Ss in all classes were, on the average, of below-average mental ability, as inferred from their scores on a brief 20-word vocabulary test that is highly correlated with a full-scale adult intelligence test.[6] The mental-age equivalents of their vocabulary scores were 1-3 years below the chronological ages of Ss. Additional, but impressionistic, evidence on student abilities is provided by teachers' questionnaire responses (Item 6, Appendix, p. 103) at the end of the year of programed instruction. These are displayed in Table 2, relating to attitudes toward homework in typewriting and toward school in general, as well as judgments of reading and arithmetic abilities. Interpretive details are given in the table footnotes.

---

[6] A description of the vocabulary test and the scores of P and C students are given on pages 43-45.

Table 2

Teachers' Judgments of Attitudes and Abilities of Programed Students[a]

Student Characteristic[b]	Year-1 Teachers		Year-2 Teachers				Mean Judgment[c]
	A	B	C	D	E	F	
Attitudes							
6a. Negative toward typing homework	D	NS	SA	A	SA	SA	2.00
6e. Negative toward school in general	SD	D	D	D	D	D	4.17
Skills							
6b. Reading skills too low to learn from reading	D	D	D	SA	SA	SA	2.50
6d. Weak in arithmetic	A	A	A	SA	A	NS	2.00

[a] SD, D, NS, A, SA stand, respectively, for strongly disagree, disagree, not sure, agree, strongly agree.

[b] The abbreviated designations represent the similarly numbered questionnaire items, which are given in full under Item 6 in the questionnaire reproduced on pp. 103-105.

[c] Weights of 5 through 1 were assigned to the judgments from SD through SA: the lower the mean, the greater the agreement with the statement.

In the judgment of their teachers, as displayed in Table 2, the programed Ss were estimated to have negative attitudes toward homework in typewriting, but not toward school in general. Arithmetic skills were judged to be weak; whereas, with regard to reading skills too low to learn from reading, teachers' views centered between "agree" and "not sure." Also evident, except for attitudes toward school, is the diversity of teacher judgments about the student characteristics listed in Table 2. In any event, these teacher judgments are congruent with Ss' vocabulary scores in characterizing Ss as ones of low ability.

A final characterization of programed Ss, bearing on their motivations toward learning to type, is provided by teachers' end-of-year estimates of the proportions of students in their classes for whom, in future years, typing skills would be of "primary use," "secondary use," or of "little or no use" (see Item 14, p. 105). Teachers were not asked to specify the bases for their percentage allocations, and no comparable data were available for the conventional Ss of the McLean investigation. Findings are displayed in Table 3.

Table 3

Teachers' Estimates of Later-Life Use
Of Typing Skills by Programed Students
(In percentages)

Extent of Use	Year-1 Teachers		Year-2 Teachers				Mean[a]
	A	B	C	D	E	F	
Primary	10	80	75	0	70	70	51
Secondary	80	18	15	50	25	25	35
Little or none	10	2	10	50	5	5	14

[a] Rounded

The classes of Teacher D were described as consisting almost exclusively of bookkeeping majors; however, the investigator has no information that could explain the puzzling discrepancies between the judgments of Teachers A and B (in School A). For whatever the impressionistic data of Table 3 may be worth, only about half the programed Ss were judged to have the primary use for typing skills in later life that one would expect to be associated with high motivation toward learning to type.

Sample Size. In the initial 25 P classes in 3 high schools there were 638 Ss on register. Loss of School C after the fall term (for the reasons given earlier) reduced the number (N) of Ss in the two remaining schools to 542. Attrition among School-A teachers at mid-year, necessitating the dropping of Ss whose spring-term teachers had not participated in the conventional instruction of the earlier McLean study, led to further reduction in the number of usable programed Ss. Gross truancy plus absenteeism during the terminal testing at the end of the school year reduced the number of usable Ss still further.[7]

The number of usable Ss from the earlier conventional classes of the McLean investigation was determined by the nature of the test battery administered to those students, as explained in the subsection on "Criterion (and Interim) Measures" (pp. 35-40).

Retaining only those conventional Ss for whom appropriate test scores were available and only those programed Ss with pertinent test scores who had a full year of P instruction under teachers involved in that instruction for the full school year, the number of usable Ss is shown in Table 4.

Table 4

Number of Usable Subjects

Under Conventional and Programed Instruction

Instruction	Year 1	Year 2	Total
Conventional	45	168	213
Programed	109	225	334
Total	154	393	547

The data of Table 4 apply to the terminal testing at the end of the school year across the various items in the test battery. Since not all Ss completed all items in the test battery, Ns for particular test items are below those shown in Table 4. Per teacher for individual test items the range was from as few as 2 conventional Ss to as many as 64 programed Ss. Details are given in the "Results" section (pp. 42-87). For the ancillary purposes of this investigation (effects of in-class vs. at-home work on the program, effects of same vs. different teachers during the programed year) and for interim testing of P students during the school year, Ns are given in the "Results" section, since these varied widely with various objectives and testing occasions. The data of Table 4 apply to the primary objective of this investigation.

---

[7] In School A, schoolwide absenteeism during the school year of programed instruction was 8 percent above the figure for the school year (two years earlier) of the conventional instruction--suggestive of a nontrivial decrement in student attitudes toward school. In School B, schoolwide attendance was high and stable throughout the period involved. The general impression of School-A teachers was that students' attitudes toward school had noticeably declined during the period of the past few years.

The earlier McLean study that provided the scores of conventional Ss did not collect attendance data on students and used all persons for whom at least one test score was available--regardless of whatever may have been the attendance history of Ss during the school year preceding the testing. Accordingly, in all testing of programed Ss, both terminal and interim, no persons were discarded for reasons of excessive absence.

Instructional Procedures

The pertinent instructional procedures for the most part apply to the programed instruction; only general information on the procedures of conventional instruction two years earlier was available, based on the remarks of participating teachers upon first examining the programed materials and upon their questionnaire responses at the end of the year (Appendix, pp. 103-105). The various procedural aspects concern: (a) differences between conventional and programed typing curricula, materials, and methods; (b) scope of programed materials assigned to P classes; (c) mode of student use of the program during the initial 2-month period of contrasted at-home vs. in-class work on the program, as well as during the at-home work by all Ss thereafter; (d) supplementary practice and test materials for programed Ss; and (e) desired and actual teacher behaviors during programed instruction. Each of these aspects is described, in turn.

Conventional vs. Programed Conditions. A number of features grossly characterize the distinctions between the two types of instruction, as conducted by the same teachers. For one thing, the P materials extend to tasks at a level of difficulty beyond that included in C instruction (e.g., tables with braced column headings, footnoted manuscripts, close estimation of words or lines in a piece of materials). For another, in P instruction, especially in first-year classes, topics were introduced much earlier than in C instruction. Third, C instruction generally specified some one procedure for carrying out a particular kind of typing task; whereas P instruction deliberately included alternative procedures (e.g., both backspace and arithmetic methods of planning tables, both fixed and moving date lines in business letters). One consequence was to place second-year programed Ss in an interference situation. That is, some programed topics had been included in the first-year C instruction of these Ss, involving placement processes differing in varying degrees from those taught in the program; thus Year-2 Ss were faced with the difficulties of replacing earlier-learned responses with different ones. Fourth, C instruction presumably used large amounts of "guidance,"[8] extending into relatively late stages of instruction; whereas P instruction early required the learner to make his own decisions about placement of materials on the page. Fifth, a larger proportion of C instruction than of P instruction, especially in first-year classes, was probably devoted to ordinary copying skills that have no bearing on the placement aspects of realistic typing tasks.[9] Sixth and most centrally, C instruction was entirely teacher-conducted, wholly reliant on oral explication of placement processes, applied for the most part to typing textbook materials plus locally prepared materials presumably supplementing the textbook. P instruction, on the other hand, was intended to be largely program-mediated. The teacher's role was to be confined to checking on the extent of student learning from the program, to providing practice at the typewriter following completion of each subsection of the program and feedback (knowledge of results) to Ss about their typed products, to furnishing only such oral instructional support as student difficulties with the program might dictate, and to maintaining student motivation. No doubt, differences between C and P instruction in addition to the six given above existed; however, those listed are judged to be the major ones.

Scope of Programed and Conventional Typing Curricula. The scope of the programed materials (see pp. 4-5) extends beyond what had been included in conventional instruction. In fact, although it was originally hoped that the entire program could be included in both first-year and second-year programed classes, the judgments of teachers led to agreement to drop several subsections dealing with advanced table typing (braced headings, unequal intercolumn spacing, blocking columns under a table title, table footnotes). Accordingly, criterion testing did not include items involving the features discarded from the instruction. Responses to Item 1 of the Teacher Questionnaire (p. 103) revealed that, among the programed topics that were to be included, one first-year teacher (Teacher A) was not able to include Section 14 on manuscript and report typing. For that teacher, the two of the six criterion test items that consisted of manuscripts represented performances based on Ss' best judgment, in the absence of pertinent formal instruction.

---

[8] "Guidance" refers to showing or telling the learner, in advance of his response, what response he is to make or, more broadly, to providing information needed for a response before the response is made. The contrasted "confirmation" tactic consists of requiring a response without prior assistance or information and then of providing a model against which the learner can assess the correctness of his response. The experimental evidence (Bugelski, 1956; Stolurow, 1959) uniformly shows that guidance is valuable if given in small doses entirely confined to the earliest stages of learning, but that it is less effective than confirmation and even harmful if given in large amounts or past the earliest stages of learning.

[9] The two first-year teachers reported (Questionnaire Item 7, Appendix p. 104) 1 and 10 percent of second-semester P instruction devoted to ordinary copying skills--those estimates being of unknown reliability. Typing textbooks and the modest clerical-typing curriculum of the school involved suggest that at least 25-30 percent of the C instruction of these teachers in the second semester of first-year classes bore on ordinary copying skills.

Among the programed topics that were included, responses to Teacher Questionnaire Item 11 (p. 104) identified as new ones, not included in their conventional instruction of two years earlier: side-bound manuscripts, footnotes, fixed date lines in business letters, estimation of copy length, backspace methods of centering tables horizontally. One first-year teacher (Teacher B) also excluded from earlier conventional instruction business letters with inserts or listings and the centering of materials in relation to the length of the writing line rather than in relation to the width of the paper. The last-mentioned feature was probably also excluded by the other teachers (it is a rather fussy feature), who failed to mention it in their questionnaires, undoubtedly through forgetfulness or oversight.

The actual scheduling of sections of the program varied within and between the first- and second-year teachers. Second-year teachers routinely omitted program sections 1-2, dealing with simple horizontal and vertical centering. Some teachers (in both first- and second-year classes) elected to begin with simple business letters (Sections 10-11); others, with simple tables (Sections 5-6 or 7-8). The order in which the various program sections were treated varied according to the judgment of the individual teacher, and the organization of the program permitted a number of different orders; e.g.: simple letters/tables without column headings/advanced letters or tables without column headings/simple letters/tables with column headings or tables without then with column headings/simple letters/advanced letters, and so on. In some instances, arithmetic and backspace methods of centering tables horizontally were taught consecutively; in other instances, simple business letters intervened between one table centering method and the other.

The only constraint imposed by the investigator was completion of specified sections of the program to permit specified testing at various times during the year of instruction; for example: simple business letters and tables without column headings (for Year-1 classes), but with column headings (for Year-2 classes), by mid-year. The remaining portions of the program (with the agreed upon exceptions noted earlier) were to be completed by the end of the school year (early June), just prior to criterion testing, following whatever time schedule the teacher desired. In some but not all instances, teachers deliberately elected to use the same order of sections and time schedule as one or another of their colleagues.

Procedures for Student Work at the Program. The mode of use of "programed instruction" is essentially standard and is represented in the instructions to Ss (Appendix pp. 101-102) distributed to students on the first day of programed work (mid-October) and discussed by the teacher, step by step, on that day and on each of the next few days. During the first two months of programed instruction (until mid-December), one of each teacher's classes worked on the program in class, under the teacher's supervision; the other class(es) of each teacher worked on the program at home. Thereafter, starting in January after the Christmas holidays, all classes worked on the program at home.

Because of the novelty of programed instruction to Ss, the generally low reading skills of Ss and their presumed resistance to reading (in contrast to listening to oral teacher instruction), and possible student resentment of "homework" for typewriting, teachers were asked to attend particularly to motivational factors and to monitor, as best as possible, adherence of students to the "rules" for work at the program (especially, no cheating--no looking at model answers in advance). In fact, students were asked to record on the first page of each program section the number of wrong answers they made. In addition, to provide empirical data on the amounts of time typically required for completing each subsection of the program, Ss were asked to record on the first page of each section the to-the-minute starting and stopping times for their work at each subsection of the program. It was the strong impression of teachers, however, that there was much "cheating," much copying of model answers in the frame blanks, and that work time entries were unreliable, often "invented" by students after the fact. Therefore, work-time data were not processed and are not reported here.

As a modest and essentially impressionistic check on the extent of student copying of model answers, all program sections were collected by teachers periodically, turned over to the investigator at the end of the school year, and examined by him. Specifically, a full set of all program sections for each of five students selected at random from each class was scanned for the frequency and nature of front-page record entries and for the frequency of wrong answers lightly lined out and accompanied by the correct answer--in accord with instructions. It was found that some students routinely recorded work times and error rates; others, only sometimes. For some students, lined-out wrong answers regularly appeared; for others, not. Very many instances of scribbled arithmetic applicable to certain placement decisions were found, suggesting that many students were making an honest attempt to respond to frame blanks before looking at the model answer. At the same time, the impressions of teachers cannot be gainsaid. It is very probable that substantial copying of answers occurred, especially for the more difficult sections of the program. Of course, looking at model answers in advance is a guidance procedure and, as such, powerful during early learning stages. For first-year Ss, the entire program is early learning; for second-year Ss the novel program topics also constitute early learning. Whether Ss who looked at model answers in advance of filling in program blanks indeed considered frame content in relation to their responses is another question --one on which no information could reliably by collected.

The 14 sections of the program were further divided into 48 subsections, each of meaningful scope and concluding with one or more unguided, unprompted test frames ("Now a little TEST"). For both in-class and at-home work on the program, the teacher assigned to Ss one or more subsections. Thus, while each S worked at each subsection at his own rate, movement from one subsection assignment to the next was on a group basis.

In summary, it must be judged that, in general, adherence of Ss to the specified procedures for their work at the program was mixed. Some seem responsibly to have responded before examining model answers; others, often not.

Supplementary Materials for Programed Classes. Supplementary materials were of two kinds: those designed to check on the extent of learning of the placement concepts taught in the programed materials and materials for actual typing. Materials of the first kind were like the "TEST" frames that concluded each of the 48 subsections of the program, but were unaccompanied by model answers. Copies were to be distributed to students in class immediately upon their completion of the pertinent programed subsection, and model answers were to be supplied by teachers after students had responded to the test items. Varying with the volume of student errors on these unprompted, unguided test items, teachers were to conduct clarifying oral instruction on the concepts reflected in the test items before having Ss proceed to actual typing of letters, tables, or manuscripts from unarranged longhand copy, unaccompanied by detailed placement instructions and requiring application of the placement concepts to the typing. A sample of such supplementary materials (applicable to table typing--and planning by arithmetic) is shown on page 28; one relating to manuscripts is shown on page 29 (top half). In these exhibits, LM and RM stand for left margin and right margin, IC is intercolumn (the number of typewriter spaces between table columns, shown circled), and CH stands for column heading. To permit quick checking of Ss' placement decisions, blanks are provided for Ss to record those decisions. The investigator sent to teachers, accompanying these supplementary materials for Ss, model answers to all test items and model typing.

The materials for actual typing incorporated into the supplementary materials were provided precisely because few typewriting textbook materials were judged to be sufficiently realistic. They are too often accompanied by explicit placement instructions, and they tend to be in perfect print rather than in the longhand that characterizes much of real-life copy for typists. The supplementary materials for actual typing provided to teachers by the investigator, however, were intended to be illustrative rather than sufficient. Teachers were therefore asked to prepare additional materials, taken from their typing textbook, but converted into longhand and unaccompanied by explicit placement instructions--in order to provide sufficient "application" practice on each kind of typing task. A sample of such materials is shown on the lower half of page 29.

Teachers were asked to turn over to the investigator, in advance of intended class use, a copy of each piece of supplementary practice materials prepared by them, modeled on those prepared by the investigator. About one hundred such items were received by the investigator during the course of the year of programed instruction (from ten fall-term teachers and six spring-term teachers). Extent of actual use of these materials in class was estimated by the six spring-term teachers at the end of the year (see

Figure 2. Sample Supplementary Materials

After 8-24

Fill in the blanks in the questions that follow the table below. IC space is circled between columns.

Stock No.		Item		Retail Price
14215		Chemistry Set		$12.60
3986	⑤	Doll	⑤	4.38
7310		Model Airplane		7.95

1. If the CH of column 1 begins at 29 on the carriage scale, the LM for that column would be set at _____.
2. The tab stop for column 2 is at 43; the CH for that column begins at _____.
3. In column 3, begin the CH at _____ and set a tab stop at _____.
4. In row 1 of the table, after tabulating to column 3, what should you do?

____

Instructions. Write a complete plan just below each of the tables below. Show side margins, tab stops, CH starting points, and a right-end check. IC is circled between columns.

(5) Pennsylvania Presidential Election Returns, 1964

(By County)

County		Johnson (D)		Goldwater (R)
Delaware		147,189		111,189
Erie	⑧	72,444	⑧	39,393
Fayette		45,155		16,127

____

(6) AMERICAN ASSOCIATIONS AND SOCIETIES

(Organization, Membership, Director, Dues)

Organization		Membership		Director		Annual Dues
Appalachian Mountain Club		11,000		Francis Belcher		$ 5
Camping Association	③	7,200	③	Ernest F. Schmidt	③	10
Financial Executives Institute		6,300		Paul Haase		50
American Gas Association		8,000		Vaughan O'Brien		15

____

7. Type table (6), above, centered horizontally and vertically on a full sheet, using proper vertical spacing within the table. The table title should be on line ___.

Your name ____________________________________ Typing Class Section _____

After 14-40 (continued)

2. Type the materials below as the last page (page 8) of a side-bound report.

As footnote 1, type a reference to a book entitled "Training for Typists," by J. R. Lee, published in 1960 by the Markham Press, in Detroit.

As footnote 2, type a reference to an article by Samuel L. Fay entitled "Machine Transcription." The article was published on pages 23-28 of the April 1969 issue (Volume 21) of "Business Monthly."

Before typing, fill in the blanks below:

a. LM is at ______; RM is at ______.

b. The page no. is typed on line ______.

c. The ms. starts on line no. ______.

d. The divider line is on line no. ______.

Effect of Dictation Machines on Job Requirements → Center this heading

The ^growing use of dictation machines is bound to affect the work done by typists. ¶ While some people believe that any good typist can ~~easily~~ switch ^with ease to machine transcription ¶ , others feel that a trained person ^can do a ~~does the~~ better job.[2] ¶ Turning out a mailable piece of work on the first try requires several ^things ~~qualities~~: understanding the meaning of the copy, selecting margins that result in attractive placement of the material on the page, and, of course, typing accurately ~~and~~ quickly ^and.

close up to 1 space

After Section 9F (Frames 66-80)

Instructions. Below is a portion of a business letter that includes a table. On any available full sheet, type the materials below. The letter has about 130 words. Determine the margins according to the length of the letter and block the table at the letter margins. Determine IC space accordingly.

Please make the following reservations for our salesmen for the coming year.

Name	Date	Rate	Length of Reservation
Jack Jones	March 5	#12	Three days
Bill Williams	April 8	15	Two days
Ron Weiss	May 10	11	Four days

Please confirm the above reservations. Thank you.

Questionnaire Item 8, p. 104), covering only the spring term. These estimates are summarized in Table 5 (programed classes only).

Table 5

Frequency of Student Typing Tasks During the Spring Semester

Type of Task	Two First-Year Teachers		Four Second-Year Teachers	
	Range	Mean	Range	Mean
Ordinary business letters from longhand copy, not accompanied by a word count (ones in which the student had to make his own estimate of length)	3-10	6½	5-9	6¾
Business letters containing a table	3-4	3½	4-5	4¾
Tables containing at least 1 column heading of more than 1 line	7-8	7½	4-5	4¾
Tables in which intercolumn space was up to the student	4-5	4½	3-6	4¾
Manuscripts containing at least 1 footnote	0-2	1	3-5	4½
Connected longhand matter for which the student had to estimate length as a basis for selecting margins leading to a typed product centered both vertically and horizontally	4-6	5	4-10	7½
Total per teacher		28		33

As total opportunities for S̲s to type full-scale vocational tasks during an entire semester, 28 and 33 are not impressive frequencies. However, not all pertinent tasks are listed in the stub of Table 5. Omitted are tables with no 2-line column headings or ones in which intercolumn space was specified in advance, business letters with a word count, and manuscripts without footnotes. Except for business letters accompanied by a word count (presumably from the typing textbook), the others were represented in the supplementary materials prepared by the investigator and by teachers, but are not listed in Table 5. Even so, the amount of actual typing of pertinent tasks was not voluminous and perhaps below that required for good mastery over the various types of tasks. Not negligible proportions of class time during the spring semester were no doubt devoted to oral explanation and discussion by teachers, as a backup to the programed instruction. Time was also devoted to ordinary copying skills of the sort measured by straight copy tests: in Year-1 classes, 10 and 1 percent; in Year-2 classes (despite the investigator's urgings to the contrary), 10, 30, 25, and 25 percent (Item 7, p. 104). Some of the teachers were apparently unable to rid themselves of the fiction that ordinary stroking skills contribute appreciably to proficiency at vocational typing tasks (see p. 3 for the pertinent research findings). No doubt, the Year-2 teachers were concerned with preparing Ss for the straight copy typing that prevails in Civil Service and much other employment testing of typists and were unpersuaded by the investigator's assurances that a few straight copy timings on each of a few days during each of the last two or three weeks of training would be sufficient preparation for employment testing of simple copying skills.

The reliability of the estimates of teachers in response to end-of-year questionnaire items is uncertain and undeterminable. It should also be mentioned that the two School-B teachers, unfortunately, responded to the questionnaire as a joint enterprise and gave identical responses to all but one item. However, they explained that they shared the task of lesson planning and scheduling and used a common set of lesson plans throughout the year. Some School-A teachers also shared materials and used a common teaching schedule, but no uniform identity was found among their questionnaire responses--as was found among School-B teachers even for "opinion" items.

Teacher Behaviors. Little detailed information about the instructional practices of participating teachers in their conventional classes could be made available. The little that has already been reported was based on questionnaire responses and inferences from the typing textbooks employed in conventional instruction. Much of what was specified by the investigator for programed instruction has also been described earlier (e.g., pp. 23, 26-31). Accordingly, the present subsection deals with the extent of teacher compliance with the investigator's specifications. These specifications were based on best estimates, and it was anticipated that they would to some extent require modification as student behavior with regard to the programed instruction might dictate. One such modification has already been mentioned: the discarding of certain advanced typing tasks as beyond what could be covered with these low-ability Ss in the time available. Other discrepancies between actual teacher behaviors during programed instruction and theoretically ideal ones (i.e., ones that might reasonably accompany a program well suited to the target audience) are described next, admittedly based on essentially anecdotal and impressionistic information, on questionnaire responses of undeterminable reliability, and on one or two classroom observations of each teacher by the investigator and by department chairmen.

Aside from the mechanics of scheduling program assignments and monitoring program distribution and collection, the principal teachers' roles were designated by the investigator as:

1. Checking on the extent of student learning from the program by following each completed subsection of the program with the unguided, unprompted, essentially test-like supplementary materials prepared by the investigator (e.g., pp. 28, 29), plus comparable materials prepared by the teacher or taken from the textbook.

2. Provision of immediate feedback (right answers) for student responses to the supplementary materials, preferably following Socratic questioning of Ss aimed at eliciting right answers from them. The teacher was to behave like the program, often by referring Ss to the pertinent programed frames and working through them step by step with the class, preferably using fresh illustrative copy materials.

3. Provision of sufficient additional materials for actual typing that required application of the placement concepts taught in the program.

4. Furnishing of immediate knowledge of results for student typing--for example, by glancing at the typed products as Ss held them high, facing the teacher, for brief visual inspection.[10]

5. Periodic formal testing and detailed teacher scoring of test papers.

Among the various teacher responsibilities, the key one arises from the fact that the programed materials deal only with concepts, not actual typewriter operation. Accordingly, the central teacher function is that of supplying a sufficient body of materials for actual typing, on the heels of completing any programed subsection, plus prompt feedback for student efforts.

---

[10] That and other modes of furnishing Ss with knowledge of results are described in the investigator's "Acquisition of Typewriting Skills" (1969), a copy of which was given to each participating teacher, with the request that designated chapters be read, principally those on "production" typewriting.

Teachers were to give only such "live" instruction on the concepts treated in the program as appeared, from Ss responses to the supplementary materials, to have been poorly learned from the program--and, even then, in the Socratic manner given in Point 2 (p. 32). They were not routinely to teach "live" the concepts about placement of materials on the page that it was the function of the program to teach.

The foregoing caveat seems to have been widely violated, judging from the comments of teachers to the investigator throughout the instructional year and from their responses to Item 13 in the end-of-year questionnaire (p. 105). Teachers claimed that Ss had substantial difficulty in applying the programed concepts to actual typing and that there was no recourse but to reteach "live" the pertinent program subsection that had been worked on by students as homework during the preceding day(s). A number of the participating teachers in fact expressed to the investigator their difficulties in restraining their habitual instructional behavior with low-ability trainees: point by point oral explanation, explication, illustration. Teachers are accustomed to "teaching" and unaccustomed to their modified role when much of instruction is preempted by another agent--in this instance, the programed materials. Thus, their live teaching probably represented a mixture of inability to restrain themselves from their habitual behavior, a tendency to extrapolate the difficulties of some students to all students and to assume that all needed the assistance of live teaching, plus undoubted particular instances of programed concepts difficult for all students. Whatever the sources of their live teaching behavior, their end-of-year questionnaire estimates of the proportion of student proficiency attributable to the program and to their live teaching ranged, for the six teachers, from 10 percent attributable to the program and 90 percent to live teaching to 35 percent to the program and 65 percent to live teaching. Across teachers, the mean or average was: Program 25%, Live Teaching 75%.

The presumed extent of live teaching would, on the face of it, call into question the propriety of characterizing the present investigation as one that tests the effects of the programed instruction, as its role has been formally defined in relation to the defined role of the teacher. Accordingly, a check on the reliability of teachers' estimates of the relative roles of the program and of their live teaching efforts was carried out. The student who is frequently absent from school cannot benefit from the teacher's instruction because he is not there to receive it. He should, therefore, be expected to perform less well than the student who is infrequently absent. Absence frequencies during the spring semester had been reported to the investigator for all students on register in each of the 16 classes of the 6 teachers; the completed program sections of all Ss had also been turned over to the investigator at the end of the school year. The investigator rank ordered Ss according to frequency of absence and located, in each of the 16 rank-ordered lists, the Ss at the 75th and 25th percentiles for absences[11] (e.g., the 8th and 24th persons in a class of 31 Ss). In instances of several Ss at the P_{75} or P_{25} absence frequency, the one whose surname was first alphabetically was selected. Criterion (final exam) scores of the two groups of Ss on one of each of the three types of tasks (ordinary business letter, simple table, ms. with footnotes) were subjected to t tests for differences in means. In the four instances (of the total of 32 Ss) in which the desired test item had not been typed by the S first selected, the S with the same absence frequency who was next alphabetically was substituted. The file of completed program sections was then checked to determine whether each of the 32 Ss had completed the pertinent sections (Nos. 6 or 8, 10 and 11, 14).

Obtained t's not statistically significant (at the .05 level) would suggest that gross differences in absenteeism had no significant differential effects on proficiency and, by inference, that the programed materials, not the live teaching, had carried the burden of instruction--despite the impressions of teachers. The high-absent S who performs as well as the low-absent S must have learned from the programed materials. The findings on the issue discussed here are given in the "Results and Discussion" section (pp. 48-50).

Another important teacher responsibility--the main one, in fact--was to provide generous amounts of practice at actual typing tasks requiring application of the placement concepts taught in the program. Details on six selected types of tasks were displayed in Table 5 (p. 30). Across those six tasks, the total for the six teachers ranged between 23 and 35, averaging 31, or about 5 per task--a rather modest number in the light of the number of trials at each type of task that one might judge to be necessary in order to establish genuine proficiency. One wishes that teachers had felt less compelled to provide oral instruction before typing--less guidance and more confirmation, more discussion of results after typing by Ss (see Footnote 8, p. 23). In that way, more actual typing could have been accomplished. The inevitable effect of much guidance before typing is to reinforce the long-established expectation of low-ability Ss that teachers will "talk" the instruction at them, thereby reducing their attentiveness to the programed homework.

---

[11] In a semester containing 72-75 actual school days, the mean number of absences at the 75th percentile was 5.56 days; at the 25th percentile, 18.19 days, for a difference of about 2½ weeks of instruction in a 15-week semester prior to the week of final testing.

A final instructional feature of high consequence is the frequency of detailed feedback for student efforts--the frequency of formal testing and detailed test scoring by teachers. No prescriptions in this regard were specified by the investigator other than urging teachers to test as often as possible. Inquiry into the number of such occasions (Questionnaire Item 9, p. 104) showed a range from 5 to 20 times during the spring semester (20, 14, 5, 10, 14, and 14 for Teachers A-F, respectively), for an average of 13. With such tests commonly consisting of a single item, and occasionally two items, detailed feedback seems rather modest in frequency in the light of the more than a dozen subclasses within the three major classes of tasks (business letters, tables, manuscripts) treated in the program.

Criterion (and Interim) Measures

The criterion tasks were those incorporated into the final testing of C and P students during the final month (June) of the year's instruction. Interim measures, applicable only to P instruction, consisted of business letter and table testing (a) just before the Christmas holidays, to assess the relative effects of at-home versus in-class work at the program and (b) at midyear (mid-January)--for the purposes given in the second paragraph of page 16. Straight copy testing (a 3- or 5-minute timing on ordinary prose materials) was also done on each testing occasion--to provide information about relationships between straight copy proficiency and proficiency at vocational typing tasks and about the relative effects on straight copy proficiency of much time spent at copying skills (C instruction) versus less time at such skills (P instruction). The latter issue also applies to the mid-December straight copy testing of at-home versus in-class programed Ss, the latter group having done less actual typing in class during the preceding two months. Criterion (June) testing also included a 20-word vocabulary test used to estimate the comparability in intellectual capacities of C and P Ss. The various test materials are displayed in the appendix, except for the vocabulary test (to preserve the security of the test and because it is copyrighted) and the straight copy materials: (a) Criterion (June final exam) production test items (pp. 107-112), (b) January production test items (pp. 112-117), and (c) December production test items (pp. 118-123).

Criterion Test Items. The testing of C students was on a 64-item test battery (24 letters, 24 tables, and 16 manuscripts), assembled into various sets of 8 items (3 letters, 3 tables, and 2 manuscripts) that it was judged could be completed by the student in one continuous week of testing (McLean, 1971). Additional C scores were obtained from a 9-item test battery (3 letters, 3 tables, 3 manuscripts) drawn from the original 64 tasks used by McLean for reliability and cross-validation purposes in his investigation. Among the original pool of 64 test tasks, 6 were chosen for final testing of P students, ones representing the three major classes of vocational typing tasks treated in the programed instruction (see Appendix pp. 107-112). Straight copy materials were also identical for C and P Ss, as was the vocabulary test.

Test Administration Conditions. For both C and P criterion testing, the production test items were assembled into booklets in a variety of orders, distributed to students serially (to minimize the frequency with which any S, at a given moment, would be working at the same task as his neighbor). A 1-page body of test instructions (p. 106) was distributed to all Ss at the outset. Test administration conditions, except as noted in Footnote 12 (p. 37), were the same for P students as for McLean's C students. Among the various test conditions, the main ones were the instructions to Ss to bring each completed task to the examiner before beginning the next task in the test booklet and to type the tasks in the order of their appearance in the test booklet. Tasks that were partially completed at the end of any test day were collected by the examiner and returned to Ss the next day for completion. Supplies were unlimited and Ss were permitted as many attempts at a task as they wished before bringing their final version to the examiner. Ss were urged, however, to use good judgment; i.e., in view of the objective of completing 6 production tasks in the 4 consecutive days of testing allotted to those tasks, tasks containing trivial errors should not be retyped.

All production tasks were from "unarranged," longhand copy, accompanied only by the general instruction to type each task attractively arranged on the page in accordance with established procedures. Products were to be proofread, and errors were to be corrected (by eraser or Ko-Rec-Type, at the option of the student). Test booklets were of course collected after each testing session and redistributed the next day.

One feature of test administration distinguished criterion from interim testing. In interim testing there was no carryover of partially completed tasks into the next day--mainly because the modesty of interim testing in the light of the available testing time made it possible for many students to complete the assigned tasks within the class period. The distinction is nontrivial because, in criterion testing, the examiners observed marked disinclination by Ss to complete the next day a task partially typed the preceding day. Instead, there was much discarding of partially typed tasks and beginning anew. Because production speed was measured by the interval (time to the nearest quarter minute) since completing the preceding task--including the time spent on the abortive, partially typed version that the S discarded--criterion test completion times were inflated in relation to interim-testing completion times on comparable test items. Indeed, programed Ss were observed to be notably more reluctant than conventional Ss to complete the next day tasks partially typed the preceding day.[12] The result was to inflate the completion times (i.e., depress speeds) of P students in relation to those of C students. Also, implicit in the behavior of Ss with regard to partially completed tasks is the failure of teachers to instruct students on realigning paper in the typewriter and to provide sufficient practice at that act. It is a common enough activity of employed typists, but not one which the programed materials could properly treat because they were concerned with conceptual, not manipulative, features.

---

[12] The present investigator assisted McLean by serving as an examiner on one day in six classes in one high school, following the administration procedures specified by McLean. Partially completed tasks were returned to examinees for insertion into the typewriter at the appropriate point on the page, in readiness for resumption of typing at the signal of the examiner. Ss who did not have an incomplete task to finish were given fresh paper. At that point the signal to begin typing was given. Nearly no instances of Ss coming to the examiner's desk for fresh paper within a minute of the starting signal were observed. Unfortunately, the present investigator was less rigid in applying the foregoing procedures to his testing of P students. The McLean study involved several thousand students, so that occasional failures to complete the entire test booklet were of little consequence. In testing of P students two years later, the present investigator was keenly impressed (and oppressed) by anticipated absenteeism on one or more days of the single week available for testing and was eager to maximize the number of completed test booklets by the end of the week. Accordingly, with the teacher's assistance, partially typed tasks were returned to the pertinent Ss while others took fresh paper (all accomplished within about two minutes); the starting signal was then given, without waiting for reinsertion of incomplete work, properly lined up for resumption of typing. The consequence was many Ss immediate discarding of incomplete work, beginning anew on fresh paper, and being "charged" for the time spent on the preceding day's incomplete task. The investigator was grievously at fault in permitting himself the described variation in test administration procedures; for the production speeds of P Ss were thereby depressed in relation to those of C Ss.

All testing was conducted by the investigator and one thoroughly trained assistant who had worked with him throughout the year on various aspects of the present investigation. Teachers were not involved in the testing, except for recording attendance and helping to distribute materials, and had no advance access to the test copy. The criterion-test week began with the vocabulary test and then a 3-minute straight copy timing, followed by the 6-item production-task booklet. Commonly, but with exceptions, the production-task booklet was begun on the second day of the test week, test orientation having been accomplished toward the end of the first day, after the vocabulary and straight copy testing.

Test Scoring. The 20-item vocabulary test was scored for number correct. The 3-minute straight copy timing--on prose at the syllabic intensity of 1.53 and stroke intensity of 6.0 that are the true averages for the vocabulary of written business communication (West, 1968)[13]--was scored for number of errors and for gross strokes, converted, for reporting purposes, to gross wpm (words per minute). The 6 production-task items also had a stroke intensity of 6.0 and were scored for speed (completion time to the nearest quarter minute) and for two classes of errors: uncorrected typographical errors (misstrokes) and "form" errors--those that have to do with placement or arrangement of materials on the page in accordance with established conventions.

---

[13] Syllabic intensity is mean number of speech syllables per dictionary word (total syllables divided by total words). Stroke intensity is mean number of typewriter strokes per dictionary word, including spacing and punctuation (total typewriter strokes divided by total dictionary words). Both indices are essentially measures of vocabulary frequency and have been found to correlate significantly with straight copy speed, but not with errors, in many studies (summarized by West, 1969, Chap. 22). The traditional assumption has been that a syllabic intensity of 1.40 and a stroke intensity of 5.0 represent "average" difficulty, and practice and test materials have for years been constructed on that assumption. The true mean values are, however, 1.54 and 6.0--the 1.53 copy of the present investigation differs insignificantly from 1.54--and the consequences of the traditional underestimation of average difficulty has been to overestimate the proficiency of students and to underprepare them for the vocabulary of real-life typing.

A team of experienced typewriting teachers, ones not involved in the present investigation, was hired to score papers. These scorers were briefed on scoring procedures in a training session conducted by the investigator and given a scoring manual (pp. 124-129). Upon completion of first-round scoring of all papers by the scorers, all papers were reexamined by one highly trained scorer (not a member of the original team) to insure consistent application of the scoring rules and to correct any errors in the original scoring. Finally, a random sample of about five percent of the scored papers was spot-checked by the investigator, who found no more than about a dozen instances of incorrect scoring (mostly overlooked typographical errors).

As is evident from the error-scoring manual (pp. 124-129) the standards of acceptability were extremely high, usually consisting of to-the-line and to-the-space exactness in placement of materials on the page and classifying as an error almost any deviation from perfection. Such standards are rather more rigorous than those commonly used by teachers, so that the error frequencies of Ss are above those that would have resulted had the same papers been scored according to ordinary teachers' standards. The objective of maximum discrimination among Ss, however, mandated the use of the rigorous error standards employed here.

Speed-scoring procedures have already been partially described (p. 37). In more detail: the record of total typing time in minutes each test day for each class was given to the scorer of the papers for that class, permitting computation of time (to the nearest quarter-minute) spent at a task partially typed on that day. For example, on a test day consisting of 32 minutes of typing, if one task was completed in 23½ minutes and another task, begun on that day, was completed after 7 minutes of work on the next day, total time for that task was 32 - 23½ + 7 minutes = 15½ minutes. Since completion time for any task on a given test day was cumulative, for two tasks completed the same day, time on Task 2 was Task-2 time minus Task-1 time [e.g., Task 2 completed after 26¼ minutes, Task 1 after 14 minutes, results in a Task-2 time of 26¼ - 14 = 12¼ minutes]. Absenteeism during the test week was differentially coded on the daily class record, so that no S was charged for work time during his absence. The daily class test record (on which entries were made as Ss brought completed work to the examiner) was also differentially color coded to show the day on which any given task in the test booklet was completed. In consequence, the reliability of speed scoring is probably near-perfect.

December and January interim testing used the procedures described above, except that there was no carryover of partially typed tasks into a second test day.

Data Analyses

Test scores, plus background and identifying data on Ss, were punched on tabulating cards and subjected to a variety of statistical analyses, both descriptive and analytical. Descriptive statistics (means, standard deviations, product-moment correlation coefficients) were computed, as applicable to the various purposes of this investigation. Statistical inferences were based, on occasion, on t tests, but for the most part on analyses of variance: 2-way ANOVA's with 1 interaction term, as given by Bancroft (1968, pp. 20-30).[14] The various analyses required by the various purposes are specified, as applicable, in the "Results and Discussion" section of this report.

Summary of Purposes

The various objectives or purposes of the present investigation, as detailed below, bear on the performance of disadvantaged high school students in first-year and second-year typing classes, treated separately. The general questions to which the present investigation was designed to contribute information are listed at the left below; the purposes or measures associated with each general question are given alongside, at the right. Below, "production" typing refers to the realistic job tasks of business letters, tables, and manuscripts; whereas "straight copy" or ordinary stroking skills are those commonly measured in employment tests and given much attention in conventional typewriting instruction.

---

[14] Step 1 of a 3-step procedure tests for the presence of any effects (between C and P treatments, among teachers, teacher-method interaction) at the .25 level. If a significant F results, the method of fitting constants (a least squares method) is applied to test for interaction (at the .25 level). If that F is significant, the main effects are also tested by that least squares method (at .05). If, on the other hand, the interaction F is not significant, the method of weighted squares of means (Yates, 1934) is used to test for main effects (at .05). The various procedures conservatively guard against a Type I error--against rejection of null hypotheses when they are true. Accordingly, those significant differences that are found may be confidently accepted as "real" ones.

Question	Associated Purpose or Measure
1. In contrast to "live," conventional instruction (characterized by much attention to ordinary copying skills and deferred teaching of production skills, accompanied by much guidance into late stages of training), what are the effects on production typing proficiency of programed instruction devoted to the decision-making or placement aspects of production typing tasks, introduced early in training and shortly requiring the learner to make placement decisions without guidance?	1. Relative effects of C (conventional) versus P (programed) instruction on proficiency in typing business letters, tables, and manuscripts.
2. Do ordinary copying skills of the kind measured in straight copy employment tests suffer when the bulk of the training is devoted to production typing rather than to ordinary stroking skills?	2. Relative effects on straight copy proficiency of much time (C instruction) versus less time (P instruction) devoted to ordinary copying skills.
3. (For disadvantaged students) is it necessary for programed (i.e., self-instructional) materials to be worked on in class, under the teacher's supervision, or can such materials be studied as homework?	3. Relative effects on early production proficiency among P students of at-home versus in-class work at the program.
4. Does early proficiency suffer when less rather than more class time is available for actual typing?	4. Relative effects on early (a) production and (b) straight copy proficiency among P students of in-class versus at-home work at the program, i.e., of little versus more actual practice at the typewriter.
5. Are these programed materials a more influential determinant of learning outcomes than teachers are? Put differently: Are the results of the P instruction due largely to the program or largely to live teaching efforts in support of the program?	5a. Relative effects on typing proficiency of the same versus different teachers during the year of programed instruction. 5b. Typing proficiency of frequently absent versus infrequently absent P students.
6. Does early attention to production tasks lead to early proficiency at such tasks approximating the later proficiency of students for whom production training is deferred?	6a. Extent of differences between January test scores of P students and June test scores of C students. 6b. Extent of differences between first-year P students and second-year C students.

Question	Associated Purpose or Measure
7. Should applicants for advanced typing training be screened on the basis of intelligence? Does explicit instruction in the decision making aspects of production typing tasks affect the role of intelligence in production typing skill?	7. Correlation coefficients for vocabulary and typing scores, as between P and C students.
8. Is the conventional substantial attention given to ordinary copying skills (on the supposition that such skills contribute appreciably to production proficiency) sound instructional practice?	8. Correlations between straight copy and production test scores, for C and P students separately and together.
9. Is each kind of production task unique, requiring separate teaching? or is there sufficient overlap among tasks to justify the expectation of transfer from one type of task to the next, thereby requiring less training time for later than for earlier types of production tasks?	9. Intercorrelations among production task scores.

Results and Discussion

The findings of this investigation relate to the various questions and purposes listed immediately above. As bases for the data on the principal objective (Question 1), findings are first presented (a) characterizing the intellectual capacities of Ss and the comparability of C and P students in that respect and (b) estimating the effects on the terminal proficiency of P students of teacher behaviors (Question 5). Then, (c) the effects of C and P instruction on terminal straight copy and production proficiency are given (Questions 1 and 2). Treated in turn thereafter are: (d) effects on early proficiency of less rather than more actual typing practice (Question 4), (e) effects on the early proficiency of disadvantaged Ss of supervised (in-class) versus unsupervised (at-home) programed work (Question 3), (f) effects of earlier introduction and accelerated presentation of production typing tasks (Question 6), (g) intelligence as a potential partial basis for screening applicants for advanced typing training (Question 7), (h) Contribution of ordinary stroking skills to production proficiency (Question 8), and (i) extent of the overlap in work processes applicable to various production typing tasks (Question 9). Finally, the impressions of teachers and chairmen about the program, via questionnaire and letter, are reported.

The propriety of contrasting the effects of differential instruction on student performance hangs, among other things, on the initial comparability of the students subjected to the differential instruction. In addition, the possible role of differences in teaching skill and of live teaching in support of an instructional mode that was to have been self-instructional (viz., the P instruction) must be considered (a) to determine whether terminal performance data should be analyzed for all *S*s or separately for those who did and did not remain with the same teacher throughout the year and (b) to characterize accurately the instructional modes labeled here as "conventional" and "programed." The findings on these preliminary issues are presented next.

Vocabulary Scores

Use of *S*s at the same grade levels in the same schools and the essentially random assignment of *S*s to classes should be expected to lead to comparable *S*s in the C and P classes. As a modest check on that expectation, Form 2 of the 20-word (5-option, multiple choice) vocabulary test from the CAVD scale developed by Thorndike and others (see Buros, 1965) was administered to C and P *S*s on the first terminal test day--as an index of general intelligence. For two of the five forms of the vocabulary test, Miner (1961) reported correlations (corrected for attenuation) with the WAIS (Wechsler Adult Intelligence Scale) of .84 and .86. Vocabulary test means and standard deviations for C and P *S*s at each of the typing grade levels are displayed in Table 6.

Table 6

Vocabulary Test Means and Standard Deviations
(By treatment and year)

Treatment	Year 1			Year 2		
	N	Mean	SD	N	Mean	SD
Conventional	42	8.19	3.10	148	7.37	2.29
Programed	107	8.02	2.03	220	7.66	2.39
All *S*s	149	8.07	2.36	368	7.55	2.35

The obtained F's in analysis of variance for each of the two years individually were .1453 and 1.32, neither of which is significant at the .05 level. Thus the C and P *S*s may be taken not to differ in vocabulary scores--to be samples from the same population of intelligence. The Year-1 mean is significantly higher than the Year-2 mean (for all Ss): $t = 2.305$, for which $p < .05$. However, that difference appears to reside in differences between the Year-2 classes of Schools A and B (means of 8.42 and 6.69 respectively, resulting in an obtained t of 7.566, for which $p < .01$). Judging from the surnames of Ss, School B had substantially more Spanish speaking students of Puerto Rican extraction, whose experience with English was presumably less than that of the more frequently native-born Ss of School A. Within School A, the Year-1 and Year-2 means (8.07 and 8.42) do not differ significantly ($t = 1.353$, for which $p > .05$).

As a basis for characterizing the intelligence of Ss in relation to norms, for all Ss in both years the vocabulary mean was 7.70 (SD = 2.37). The test items are scaled according to difficulty, so that failure at Item 9 is likely to mean failure at Items 10-20, except for correct guesses. Taking 8 as the typical score of the present Ss, the average S knew that *concur* means *agree* but did not know that *downcast* means *sad*. An unpublished compilation of normative data on the vocabulary test[15] provides yardsticks against which to assess the intelligence of the present Ss. For example (Miner, 1957): (a) for 74 persons who had completed 9-12 years of school the mean was 10.68, (b) for 110 persons aged 14-17 years the mean was 9.71. Although mental ages above 12 have uncertain meaning, in relation to the means of the present Ss (Year 1 = 8.07, Year 2 = 7.55, All Ss = 7.70), data furnished by Thorndike (1942)[16] assigned mental-age equivalents (in years and months) of 13-8 and 13-10 to a vocabulary score of 8 and mental ages of 12-0 and 13-0 to a score of 7. About half the present Year-1 Ss were 9th graders (age 15), the remainder 10th graders; Year-2 Ss were 10th and 11th graders (ages 16 and 17).

From the various data given above it is apparent that the present Ss were of below-average intelligence; i.e., their mean scores were below those of norm groups of comparable chronological age and schooling, and the mental-age equivalents of their vocabulary scores were 1-3 years below the chronological ages characteristic of their school grade levels.

---

[15] From the Institute of Psychological Research at Teachers College, Columbia University (1957), entitled "Vocabulary Test-GT, Directions and Norms."

[16] Based on two forms of the Otis Self-Administering Intelligence Examination administered to 538 pupils in grades 7-9 and 456 pupils in grades 10-11.

In summary, the Ss in the C and P classes did not differ significantly in intelligence (i.e., vocabulary) and were clearly of below-average general mental ability.

Role of Teacher Behaviors in Programed Instruction

As explained earlier (pp. 13-14) some P Ss in School A remained with the same teacher throughout the school year; others changed from one P teacher to another for the second semester of the year. (All Ss in School B remained with the same teacher throughout the year.) The School-A shifts raise the question of whether data analyses need to be carried out separately for Ss who did and did not remain with the same teacher throughout the year; and the underlying issue is one of whether the programed materials played a role in determining outcomes sufficient to overcome whatever differences in teaching skill and teaching procedures may have been applied to Ss taught by different teachers during the year.

A parallel and more compelling issue--in the light of the reports by P teachers of much live instruction in support of the programed materials (see pp. 33-34)--concerns the contribution to outcomes of the live teaching activities of P teachers and, thereby, the question of whether those outcomes may be attributed more to the programed materials than to the live teaching support or vice versa.

The findings on each of the foregoing two issues are given next: the first, via analyses of terminal test scores of same-teacher versus different-teacher Ss; the second, via data analyses of terminal test scores of frequently absent and infrequently absent programed Ss, as specified earlier (pp. 33-34).

Same vs. Different Teachers. Analyses of variance (as given on page 40) were applied to the June (final) test scores of same-teacher vs. different-teacher Ss in P classes. The criterion measures, as listed in the stubs of Tables 7 and 8 (pp. 46 and 47), consisted of the vocabulary test scores, the number of production test items completed during the test week (out of a possible maximum of six), the SC (straight copy) speed (gross wpm) and number of errors (in a 3-minute timing), and the speed (completion time to the nearest quarter-minute) and number of "form" errors (those in arrangement or placement of materials on the page) and number of uncorrected typographical errors (typos) on each of six production test items. Tables 7 and 8 display descriptive statistics in the center and the results of F tests at the right. "Treatment" refers to the same-different dichotomy; "Teacher," to variations among teachers regardless of treatment. "Interaction" means that, for some teachers, Ss who remained with them throughout the year were superior to those who changed teachers, whereas for other teachers the converse prevailed.

Table 7

Criterion Test Statistics of Year-1 Programed Students
Taught by the Same or Different Teachers

Variable[a]	Same Teacher			Diff. Teacher			Probability of Obtained F[b]		
	N	Mean	SD	N	Mean	SD	Treatment	Teacher	Interaction
Vocabulary	53	8.17	2.04	54	7.89	2.02	NS	NS	NS
No. of Tasks	53	4.81	1.36	56	5.18	1.19	NS	$<.005$	NS
SC speed	53	28.20	6.61	53	30.39	9.11	NS	NS	$<.10$
SC errors		5.26	3.25	53	7.09	4.75	NS	NS	$<.25$
Letter 2									
Speed	36	111.58	38.21	49	106.37	35.47	NS	NS	NS
Typos		3.42	3.57		5.27	4.11	NS	NS	NS
Form		3.89	5.24		4.06	2.37	NS	NS	NS
Letter 17									
Speed	46	51.26	24.53	50	49.26	27.40	NS	NS	$<.10$
Typos		1.93	2.86		2.28	2.02	NS	NS	NS
Form		1.63	1.61		1.66	1.55	NS	NS	NS
Letter 23									
Speed	48	82.77	37.44	48	66.02	27.84	NS	$<.05$	NS
Typos		3.17	3.57		4.23	3.56	NS	NS	$<.01$
Form		1.92	3.06		2.17	1.86	NS	NS	NS
Table 4									
Speed	41	96.95	34.30	46	95.91	34.89	NS	NS	NS
Typos		3.07	2.98		3.39	2.99	NS	NS	NS
Form		2.85	2.71		4.43	2.26	NS	$<.005$	$<.25$
Manuscript 1									
Speed	41	82.66	27.17	47	83.66	34.40	$<.025$	$<.005$	NS
Typos		4.00	2.97		5.94	4.85	NS	NS	NS
Form		5.73	2.61		7.47	2.49	NS	$<.005$	NS
Manuscript 15									
Speed	43	51.09	24.40	48	45.79	26.31	NS	NS	NS
Typos		1.65	2.28		2.00	2.04	NS	NS	NS
Form		1.67	1.04		1.79	1.30	NS	NS	NS

[a] The six production tasks (Letter 2 through Manuscript 15) are on pp. 107-112.

[b] NS means not significant (at the .25 level for interaction, at .05 for treatment and teacher).

Table 8

Criterion Test Statistics of Year-2 Programed Students
Taught by the Same or Different Teachers*

Variable	Same Teacher			Diff. Teacher			Probability of Obtained F		
	N	Mean	SD	N	Mean	SD	Treatment	Teacher	Interaction
Vocabulary	68	8.72	2.20	45	8.22	2.28	NS	NS	NS
No. of Tasks	68	4.69	1.60	46	5.00	1.40	NS	NS	<.005
SC Speed	65	38.56	7.31	42	36.69	8.90	NS	NS	NS
SC Errors		7.20	4.37		8.07	5.09	NS	NS	NS
Letter 2									
Speed	48	77.23	26.17	35	81.71	24.91	NS	NS	<.25
Typos		4.50	3.41		2.60	2.58	<.01	NS	NS
Form		3.44	1.91		4.00	2.39	NS	NS	<.10
Letter 17									
Speed	55	34.55	13.36	39	45.46	20.42	<.005	NS	NS
Typos		2.31	2.61		1.79	1.78	NS	NS	NS
Form		2.00	1.82		1.54	1.48	NS	NS	NS
Letter 23									
Speed	58	52.88	19.94	41	52.22	15.44	NS	NS	NS
Typos		3.88	3.17		2.61	2.52	<.05	NS	NS
Form		1.53	1.60		1.73	1.61	NS	NS	NS
Table 4									
Speed	51	72.86	29.91	38	77.18	29.62	NS	<.005	NS
Typos		3.57	3.23		2.29	2.34	<.05	NS	NS
Form		4.61	2.84		4.61	3.23	NS	NS	NS
Manuscript 1									
Speed	58	71.20	34.58	37	70.70	29.55	NS	NS	<.25
Typos		5.84	3.90		4.43	3.91	NS	<.025	NS
Form		4.84	1.91		5.16	2.56	NS	<.005	NS
Manuscript 15									
Speed	50	33.68	11.41	38	34.26	14.89	NS	NS	NS
Typos		1.68	1.72		1.36	1.68	NS	NS	NS
Form		2.06	1.48		2.08	1.17	NS	<.05	NS

*The footnotes of Table 7 also apply here.

Tables 7 and 8 show comparable general ability (i.e., vocabulary scores) among programed Ss taught by the same or different teachers. Of the remaining 21 variables in the stub of each table (42 variables for both years), for 5 (fewer than one-eighth of them) there were significant treatment effects. Of those 5, 3 relate to uncorrected typographical errors on which the programed instruction had no bearing whatever, while none was for "form" errors, which are the central focus of the P instruction. Nine instances of significant differences among teachers, independent of the same-different dichotomy, were about as often in one direction as the other (as between Teachers A and B in Year 1 and Teachers C and D in Year 2). Of the 42 typing performance variables in Tables 7 and 8, there were nine signficant interaction effects, two of which were at probability levels of .05 or less. Taken together, in the light of the issue to which the data of these tables apply (viz., treatment effects), it may be concluded that the role of the programed materials in relation to the terminal proficiency of Ss transcended, in the great majority of instances, the possible effects of instructional variations accompanying a change of teachers during the year and, in turn, that analyses of terminal performance differences between P and C students may be carried out for all Ss in those two groups, without regard to a change of teacher, i.e., with the "teacher" component of these analyses referring to the spring-semester teacher.

Live Teaching Support for the Programed Instruction. As described earlier (pp. 33-34), if the live teaching support for the P instruction was as consequential as teachers estimated it to be, then the performance of the frequently absent student should be expected to suffer. On the other hand, if the programed materials played the more substantial role in instruction, there should be little to choose between the terminal performance scores of frequently absent and infrequently absent Ss. Following the procedures described on page 34, absence data for the 16 classes of the 6 teachers during the spring semester are shown in Table 9.

Table 9

Range and Mean for Days Absent (Spring Semester)
At Selected Percentiles

P	Range	Mean
All Ss	0-59	
At P_{75}	2-10	5.56
At P_{50}	7-26	11.94
At P_{25}	11-34	18.19

In a semester containing 72-75 school days prior to final testing the median number of absences was about 12 days (i.e., P_{50} = 11.94 days). The present contrast is one for a difference of 12.63 days of absence (18.19 minus 5.56) or about 2½ weeks in a 14-15 week semester. The criterion test statistics and the results of *t* tests for vocabulary, a business letter (see p. 112), a table (p. 109), and a manuscript with footnote (p. 110) are shown in Table 10.

Table 10

Criterion Test Statistics for the P_{75} and P_{25} Absentees

Variable	Mean			SD		t (Means)	p
	P_{75}	P_{25}	Diff.[a]	P_{75}	P_{25}		
Vocabulary	8.06	7.81	- .25	1.56	2.16	.363	NS
Letter 23							
Speed	48.06	54.94	6.88	14.94	18.14	1.134	NS
Typos	3.25	5.31	2.06	2.38	3.96	1.725	NS
Form	1.62	2.31	.69	1.36	1.57	1.276	NS
Table 4							
Speed	82.92	62.56	-20.38	32.81	21.46	6.367	$<.01$*
Typos	2.44	4.69	2.25	1.90	3.40	.722	NS
Form	4.25	5.75	1.50	2.82	2.61	1.512	NS
Manuscript 1							
Speed	73.19	65.25	- 7.94	47.35	32.47	.536	NS
Typos	5.69	7.38	1.69	3.58	4.03	1.214	NS
Form	5.12	6.50	1.38	2.57	2.83	1.393	NS

[a] P_{25} minus P_{75}

*The difference between means is statistically significant at the .01 level. For all *t* tests, df = 30 (i.e., 16 + 16 - 2).

As shown in the first data row of Table 10, the two groups of absentees do not differ significantly in general ability (i.e., vocabulary). For 7 (of 9) production test criterion measures (speed, number of uncorrected typographical errors, number of errors in form or arrangement on each of the three types of production tasks), the differences favor the less frequent (P_{75}) absentee--higher speeds (i.e., shorter completion times) and fewer errors. In all but one instance, however, the differences are small enough in relation to the variability in scores to be attributable to sampling fluctuation rather than to the differences in extent of absenteeism. Indeed, the one significant difference (Table 4 speed) favors the more frequent (P_{25}) absentees.

In drawing inferences from the data of Table 10, several questions arise. For one, is a 2½-week difference in absences enough of a difference to make a difference? For example, if there is redundancy in instruction (several days of practice being devoted to a particular kind of typing task) and if absence tends to be scattered a day at a time rather than concentrated in blocks of several days, perhaps attendance on some but not all of the days given to a particular task is sufficient. No data on the distribution of absences are available. However, teachers reported that in order to meet the investigator's prescriptions for program coverage by the end of the semester they had to proceed at a breathless rate through the program subsections, leaving little time for redundant or repetitious practice at a given kind of task. Instead, redundancy was built into the programed materials and is intrinsic to a given class of typing task; for example, the processes applicable to the design of a simple table also apply to more complex tables. The foregoing discussion notwithstanding, more extreme differences in absenteeism could of course have been contrasted (e.g., P_{80} vs. P_{20} or P_{90} vs. P_{10}). The former possibility would change less frequent absence from 5.56 days to 5.00 days and more frequent absence from 18.19 to 20.31 days--the difference changing from 12.63 days to 15.31 days, or from 2½ to 3 weeks. In view of the varieties of typing tasks covered, those changes (from the P_{75} and P_{25} values to the P_{80} and P_{20} values) hardly seem sufficient to be sensitive to whatever redundancy may have been present in teachers' oral instruction. The more extreme alternative (P_{90} vs. P_{10}) is not a practicable ones because the P_{10} absentee ranged up to 49 days (10 weeks) of absence, averaging 29.19 days or nearly 6 weeks in a 14-15 week semester. Those were often persons frequently or entirely absent during the test week, so that test scores, required for the comparison with P_{90} absentees, were often nonexistent. All things considered, the P_{75} vs. P_{25} contrast reported here seems a reasonable choice.

A second alternative hypothesis is represented by the possibility that the more frequent absentee tends to be the one who learned from study of the program and who deliberately absented himself from class on the day or days immediately following completion of a programed subsection to save himself the boredom (to him) of unnecessary teacher explanations. That hypothesis seems to the investigator to be, on the face of it, rather far-fetched--especially since it is not common practice for teachers to inform Ss in advance of instructional plans for subsequent day(s).

A third possibility is that Ss might have absented themselves on days primarily devoted to ordinary stroking skills rather than to production typing activities associated with the programed materials. That supposition may be dismissed out of hand: partly because teachers reported that the prescribed coverage of programed topics required virtually daily production typing during the spring semester, partly because ordinary stroking skills are commonly attended to via 5-10 minutes of "warmup" at the beginning of each class period rather than via all or most of a class period devoted to such skills, and partly because Ss' complaints of insufficient practice at ordinary copying skills ("Where you don't have to think"), as reported by teachers, would hardly lead Ss to absent themselves from ordinary copying practice--were it to be assumed, doubtfully, that some lessons were mostly devoted to such practice and that Ss were so informed in advance.

The various alternative hypotheses discussed above do not seem to be persuasive ones. Although it is not possible to allocate percentages to the relative roles of the program and of live teaching in accounting for the terminal performance of programed Ss, the data of Table 10 make apparent that teachers' oral explications of programed "placement" concepts were decidedly less consequential than teachers had estimated (75 percent). Indeed, the programed materials may well have been as consequential as, or even more important than, live explication of programed placement concepts.

Terminal Performance--C vs. P Instruction

The findings on the terminal performance of programed Ss taught by the same or by different teachers during the year (pp. 45-48) permit dealing with all programed Ss as one group; and the general absence of statistically significant differences in terminal performance between frequently and infrequently absent programed Ss (Table 10) permits characterizing the P instruction as one in which the supporting live instruction did not play the dominating role--despite the estimates of teachers. Accordingly, the terminal test statistics for the programed and conventional Ss--relating to Questions 1 and 2 (p. 41)--are displayed in Tables 11 and 12, for Year-1 and Year-2 Ss. Descriptive statistics are given in the center section of these tables, and the analysis of variance results (F tests) are shown at the right. "Treatment" refers to P vs. C instruction; "Teacher," to variations among teachers regardless of treatment. "Interaction" means that for some teachers P Ss were superior to C Ss, whereas for other teachers the converse prevailed. The "treatment" effects are of course the ones of interest, and significant treatment effects (i.e., ones whose probabilities are less than .05) are indicative of real differences in the outcomes of P and C instruction, over and above "teacher" and "interaction" effects.

Table 11

Criterion Test Statistics of Year-1 Conventional and Programed Students

Variable[a]	Conventional			Programed			Probability of Obtained F[b]		
	N	Mean	SD	N	Mean	SD	Treat.	Tchr.	Interact.
Vocabulary	42	8.19	3.10	107	8.03	2.03	NS	NS	NS
SC speed	44	29.98	9.91	106	29.29	8.00	NS	NS	<.01
SC errors		7.18	4.84		6.18	4.15	NS	NS	<.10
No. of Tasks	45	5.04	1.83	109	5.00	1.28	NS	<.001	NS
Letter 2									
Speed	15	70.40	25.58	85	108.58	36.52	<.025	NS	NS
Typos		6.80	5.63		4.48	3.98	NS	NS	NS
Form		10.67	5.19		3.99	3.82	<.001	NS	NS
Letter 17									
Speed	21	44.67	24.94	96	50.22	5.95	NS	NS	NS
Typos		3.29	2.65		2.11	2.45	NS	NS	NS
Form		4.52	1.44		1.65	1.57	<.001	NS	NS
Table 4									
Speed	17	55.65	27.77	87	96.40	34.42	<.001	<.025	<.05
Typos		2.65	2.89		3.24	2.97	NS	NS	NS
Form		11.65	3.87		3.69	2.59	<.001	<.005	NS
Manuscript 1									
Speed	23	76.57	32.46	88	83.19	31.07	NS	<.05	NS
Typos		5.96	3.51		5.03	4.18	NS	NS	NS
Form		10.78	3.53		6.66	2.68	<.001	<.001	<.25
Manuscript 15									
Speed	22	34.95	17.09	91	48.30	25.43	NS	<.025	NS
Typos		1.27	1.12		1.84	2.15	NS	NS	NS
Form		3.27	1.08		1.74	1.18	<.001	NS	NS

[a] The production test tasks are shown on Appendix pages 107-112.

[b] NS means nonsignificant (at .25 for interaction, at .05 for treatment and teacher).

Five, rather than six, production tasks are listed in Table 11 because for the sixth task (Letter 23) there were no scores for conventional Ss; that is, no conventional Ss taught by one or another of the teachers also involved in the P instruction had completed Letter 23 during the Year-1 testing in the earlier investigation (McLean, 1971) that provided the scores of C students. For Year-2 Ss, however, Letter-23 scores were available (Table 12).[17]

Table 12

Criterion Test Statistics of Year-2 Conventional and Programed Students*

Variable	Conventional			Programed			Probability of Obtained F		
	N	Mean	SD	N	Mean	SD	Treat.	Tchr.	Interact.
Vocabulary	148	7.37	2.29	220	7.66	2.39	NS	<.001	NS
SC Speed	147	36.09	7.50	216	36.73	7.42	NS	<.005	NS
SC Errors		8.20	4.59		8.05	5.48	NS	NS	NS
No. of Tasks	168	5.84	1.94	224	5.15	1.34	<.001	<.025	<.01
Letter 2									
Speed	56	69.23	19.19	181	84.90	26.56	<.025	NS	NS
Typos		3.98	3.82		3.96	3.46	NS	NS	NS
Form		7.79	2.90		3.97	2.30	<.001	NS	NS
Letter 17									
Speed	72	37.00	12.97	195	42.07	17.82	NS	NS	NS
Typos		2.71	2.53		1.98	2.11	NS	NS	NS
Form		4.24	1.97		2.22	1.84	<.001	NS	NS
Letter 23									
Speed	22	53.82	17.76	112	56.86	18.68	NS	<.025	<.025
Typos		3.86	2.49		3.46	2.96	NS	NS	NS
Form		3.86	2.34		1.96	1.59	<.001	<.01	<.25
Table 4									
Speed	61	64.98	24.19	188	76.87	29.28	<.05	NS	NS
Typos		2.43	2.61		2.90	2.77	NS	NS	NS
Form		8.03	3.34		4.86	2.91	<.001	<.01	<.10
Manuscript 1									
Speed	68	61.10	26.12	200	70.58	27.20	NS	NS	NS
Typos		4.32	3.45		5.38	3.83	<.05	NS	NS
Form		10.07	3.20		5.10	2.28	<.001	<.005	<.25
Manuscript 15									
Speed	73	36.68	14.32	188	37.72	17.17	NS	<.05	<.025
Typos		1.34	1.45		1.56	1.72	NS	NS	NS
Form		3.10	1.70		2.09	1.36	<.001	<.025	<.25

*The footnotes of Table 11 also apply here.

---

[17] Letter 23 was completed by Year-2 C students in the classes of Teachers D and F only. The Ns for the other five production tasks (in Tables 11 and 12) include C students taught by all six teachers (A-F), as do all scores of P students in Tables 11 and 12.

The criterion test means of C and P Ss for each of the six teachers individually are shown in Table 26 (page 100). In order to provide a visually clearer basis for discussion of the findings across teachers, selected data from Tables 11 and 12 are displayed in another form in Table 13. Of the three criterion measures, uncorrected typographical errors have no bearing on the instructional focus on placement concepts; accordingly, no significant differences between P and C Ss were anticipated. That expectation is in excellent accord with the findings: of the 11 production tasks listed in Tables 11 and 12, in only one instance (Manuscript 1, Year 2) was there a significant difference in number of "typos." Accordingly, Table 13 omits the data on "typos."

Table 13

Criterion Test Means and Significance Tests for Year-1 and Year-2 Conventional and Programed Students

Variable	Year 1				Year 2			
	Mean			Treat. p <.05	Mean			Treat. p <.05
	C	P	C - P		C	P	C - P	
Vocabulary	8.19	8.03	.16	no	7.37	7.66	- .29	no
SC Speed[a]	29.88	29.29	.69	no	36.09	36.73	- .64	no
SC Errors	7.18	6.18	1.00	no	8.20	8.05	.15	no
No. of Tasks	5.04	5.00	.04	no	5.84	5.15	.69	yes
Speed[b]								
Letter 2	70.40	105.58	- 38.18	yes	69.23	84.90	-15.67	yes
Letter 17	44.67	50.22	- 5.55	no	37.00	42.07	- 5.07	no
Letter 23	---	---	---	---	53.82	56.86	- 3.04	no
Table 4	55.65	96.40	- 40.75	yes	64.98	76.87	-11.89	yes
Ms. 1	76,57	83.19	- 6.62	no	61.10	70.58	- 9.48	no
Ms. 15	34.95	48.30	- 13.35	no	36.68	37.72	- 1.04	no
Total	282.24	386.69	-104.45		322.81	369.00	-46.19	
Form Errors								
Letter 2	6.80	4.48	2.32	yes	7.79	3.97	3.92	yes
Letter 17	4.52	1.65	2.87	yes	4.24	2.22	2.02	yes
Letter 23	--	--	--	---	3.86	1.96	1.90	yes
Table 4	11.65	3.69	7.96	yes	8.03	4.86	3.17	yes
Ms. 1	10.78	6.66	4.12	yes	10.07	5.10	4.97	yes
Ms. 15	3.27	1.74	1.53	yes	3.10	2.09	1.01	yes
Total	37.02	18.22	18.80		37.09	20.20	16.89	

[a] Gross words per minute

[b] Completion time to the nearest quarter minute

Table 13 provides a bird's eye view of the findings on the chief issues of this investigation: effects of the differential instruction on terminal proficiency at (a) production typing tasks (Question 1, page 41) and at (b) straight copy typing (Question 2, p. 41). It may first be noted (Table 13) that there were no significant differences in vocabulary scores; the P and C students were comparable in general intellectual ability. Accordingly, differences in typing performance may be attributed to the differential instruction.

Production Typing Speed. As shown in Table 13 ("No. of Tasks"), Year-2 C Ss completed during the week of testing significantly more tasks than did P Ss--an outcome that parallels the faster completion times for C Ss shown in the "Speed" section of Table 13. In that connection it is pertinent to mention that P Ss worked from a 6-task booklet, whereas C Ss worked either from an 8-task booklet used in McLean's original testing or from a 9-task booklet administered to different Ss to estimate test reliability. It is conceivable, although not determinable or testable, that advance awareness of the scope of the work (6 vs. 8 vs. 9 tasks to be completed) affects work rates--that typists pace their work at a rate they estimate will accomplish it in the time available, an instance of Parkinson's Law. If so, part of the difference of .69 in number of production tasks completed by Year-2 C and P Ss might reflect differences in number of tasks in the test booklet.

That speculation aside, more direct evidence is furnished by the "Speed" data of Table 13. As shown, C Ss in Year 1 were significantly faster than P Ss in two out of five instances; in Year 2, in two out of six instances. Summing across tasks and converting quarter minutes to whole minutes, Year-1 C Ss completed five tasks in 70.5 minutes; P Ss, in 96.7 minutes, for a difference that approximates 26 minutes. Put another way, C Ss completed five tasks in 73 percent of the time required by P Ss (282.24/386.69). Smaller differences, but in the same direction, were found for Year-2 Ss, covering six (not five) tasks: 80.7 vs. 92.25 minutes for C and P Ss respectively, for a difference of 11.55 minutes; Year-2 C Ss completed the work in seven-eighths the time required by Year-2 P Ss (322.81/369.00 = 87.5 percent).

The statistically significant speed differences, it may be noted, pertain to planning the layout of tables (Table 4 and Letter 2, which contains a table--see Appendix pp. 109 and 107). For the simpler letters and the two manuscripts, the speed differences were of a size that could arise by chance more than five percent of the time in samples of the present size.

The five (or six) production subtests of Table 13 are based on different Ns--the identical group of Ss was not involved in each subtest. Even so, and despite the absence of statistically significant speed differences in three out of five (Year 1) and four out of six (Year 2) instances, the accumulated means show substantial speed differences in favor of conventional Ss. In the light of the greatly fewer form errors by programed Ss and in view of the dominating focus in the programed materials on placement concepts reflected by a product typed in correct form, "taking the time to do things right" by "thinking before you type" would seem the most likely explanation for the longer task completion times of programed Ss. It had originally been conjectured (by the investigator) that unremitting attention in the programed materials to placement features might lead to higher speeds than those of conventional Ss, who, in their presumed lesser mastery over placement features, would need more time to make placement decisions before beginning to type. However, that conjecture is not borne out by the results, perhaps because of insufficient practice among programed Ss at applying placement decisions to actual typing in the classroom (too much teacher talk--not enough student typing). Footnote 12 (p. 37) is also applicable.

Before turning to error findings, the speed data are presented, in Table 14, in gross words per minute, a form familiar to typewriting teachers. "Length" is number of 5-stroke words, including the conventional 1-stroke allowance for each operation of a service mechanism (space bar, tabular key, carriage return, backspacer) and covering the entire task (e.g., from date through initials or enclosure in a business letter). Words per minute (wpm) is computed as number of words divided by completion time in minutes.

As shown in Table 14 (page 57), production speeds ranged from a low of 3.11 wpm on a table among first-year typists to a high of 11.15 wpm on a simple letter by second-year typists. Those speeds may be contrasted with their straight copy speeds of about 30 and about 37 wpm (Tables 11 and 12), varying from about one-tenth to about three-tenths of straight copy speed (10.6 percent and 30.9 percent, to be exact). Error correction no doubt accounts for some of the loss in speed. Most of it, as handsomely demonstrated by Muhich (1967) and corroborated here, is attributable to the time-consuming placement decisions of production typing and to the different set (i.e., perception) adopted toward production tasks, leading to the use of slower keystroking rates than those of straight copy typing. Findings such as these are typical and demonstrate not only the fallacy of the conventional assumption that ordinary copying skills are important contributors to production proficiency, but the foolishness and irrelevance of production typing standards applicable to prearranged tasks, requiring no placement decisions by the typist. The production speeds of Table 14 are for typists of below-average general ability, but they are only a few words per minute (about 5-10) below the production speeds found among more able students whose straight copy speeds were substantially above those of the present Ss (see West, 1969, Chap. 13 for a summary of the earlier research).

Table 14

Production Speeds (wpm) of Year-1 and Year-2 Conventional and Programed Ss

Subtest	Length (in words)	Description	Words per Minute			
			Year 1		Year 2	
			C	P	C	P
Letter 2	150	Letter with table	8.52	5.53	8.67	7.07
Letter 17	75	Letter with listing	6.72	5.97	8.11	7.13
Letter 23	150	Simple letter	--	--	11.15	10.55
Table 4	75	4-column table	5.39	3.11	4.62	3.90
Ms. 1*	150	Ms. with footnote and corrections	7.84	7.21	9.82	8.50
Ms. 15*	75	Simple ms.	8.58	6.21	8.18	7.95
All Tasks	675		7.44	5.43	8.36	7.32

*Manuscript 1 uses fixed margins that do not have to be estimated; ms. 15 requires estimation of length of copy to determine appropriate vertical and horizontal margins--probably accounting for the somewhat lower speeds on what would appear, superficially, to be the simpler task. Or, on ms. 15, a bad guess at margins was made at the first trial, and the task was retyped.

Also apparent in Table 14 are differences in inter- and intratask difficulty. A 75-word table was typed at about two-fifths the speed of a simple letter that had twice as many words; a letter containing a table was typed at about 70 percent of the speed of a simple letter of the same length. Phenomena such as these demonstrate that it is internal task features, not mere word length, that determine task difficulty.

Form Errors in Production Typing. As shown in Tables 11 and 12 (pp. 52-53), differences in number of form errors were found to be highly significant ($p < .001$) for each production task in each year. Table 13 (p. 54) shows the differences to be very large and uniformly in the direction of fewer errors by P Ss. Specifically, in Year 1, form errors for P Ss were 49.2 percent of those for C Ss (18.22/37.02); in Year 2, form errors by P Ss were 54.5 percent of those for C Ss (20.20/37.09). Although the error differences are very large, the absolute number of errors made by P Ss shows that their performance does not tend to meet business standards of acceptability. An average (Years 1 and 2 together) of about 3½ form errors per task among P Ss and of about 6¾ form errors per task among C Ss constitutes "unmailable" work. Neither the conventional nor the programed instruction equipped students to carry out realistic vocational typing tasks at acceptable levels of quality. Programed instruction, however, brought about substantial improvement in quality of work, and it is conceivable that improvements in the programed materials and in the associated instructional activities of teachers could lead to marketable levels of quality or accuracy for vocational typing tasks.

Finally, it may be noted (Table 13) that the chief difficulties reside in the layout of tables and in the correct placement of manuscript footnotes (Table 4, Letter 2 containing a table, Manuscript 1); for those three tasks the number of form errors is notably higher than for the other tasks. For Manuscript 1, however, the Year-1 form errors among P Ss (6.66, in Table 11) were inflated by the students of Teacher A, who excluded manuscript typing from the instruction: for Year-1 Teachers A and B, mean number of form errors on Manuscript 1 among their P Ss were 8.33 and 4.65 respectively.

Overall Terminal Production Proficiency of C and P Students. For Years 1 and 2, of 11 production task comparisons, there were four significant differences in speed, favoring C Ss; whereas significant differences in form errors were found in all 11 instances, all favoring P Ss. The effects of P instruction were to reduce form errors to about half the number made by conventional Ss, at the price of a reduction in speed of 27 percent among Year-1 Ss and of about 12½ percent among Year-2 Ss. Since, with occasional exceptions, form errors tend to be uncorrectible and to require complete retyping of the task, it is apparent that the very large superiority of P Ss in the quality of their work swamps the loss in speed. Overall, significant superiority in production proficiency is evident for progamed over conventional instruction among the low-ability vocational high school students of this investigation.

Straight Copy Proficiency. As shown in Table 13, differences in straight copy speed between C and P Ss in Years 1 and 2 were trivially small (less than 1 wpm) and not statistically significant. Small differences in errors in favor of fewer errors by P Ss were also not statistically significant. In view of the substantially larger amount and proportion of training time devoted to ordinary copying skills in conventional instruction, as compared to programed instruction, it is apparent that ordinary copying proficiency does not suffer when the bulk of the training is given to production typing rather than to direct speed and accuracy practice aimed at copying skills. In view of the typical negative acceleration of the performance curve for ordinary stroking skills, one might speculate that for those whose copying skills are as modest as those of the present Ss any kind of typing leads to gains. Whatever the explanation may be for the equivalent copying skills of the present Ss, despite gross differences in amount of practice at such skills, the present findings demonstrate the fallacy in the conventional focus on copying skills and in the typically late introduction of production typing tasks and point to the desirability of early introduction of production typing tasks and dominating attention to such tasks thereafter. Correlational data (pp. 77-78) are congruent with the foregoing recommendation; production proficiency is only trivially related to and, by inference, dependent upon copying proficiency.

Year-1 vs. Year-2 Proficiency. Of tangential interest (i.e., not among the direct objectives or purposes of the present investigation) is the question of gains accruing from a second year of training. These are displayed in Table 15 (speed) and Table 16 (errors). It should be noted that different Ss are involved in the two training years; the gains or changes are *not* for the same persons in a second year of training. It may be recalled, however, that in School A, at least, Year-1 and Year-2 vocabulary scores did not differ significantly (p. 44). Also, a substantial proportion of all Ss were in School A.[18] Tables 15 and 16 apply to both schools, A and B.

---

[18] School A included all the Year-1 Ss and, in Year 2, 70 of the 148 (47.3%) conventional Ss and 113 of the 220 programed Ss (51.4%)--or nearly half (49.7%) of all Year-2 Ss.

Table 15

Differences Between Year-1 and Year-2 Speed Means (wpm)

Variable	Conventional			Programed		
	Year 2	Year 1	Diff.[a]	Year 2	Year 1	Diff.[a]
Straight copy	36.09	29.98	6.11	36.73	29.29	7.44
Letter 2	8.67	8.52	.15	7.07	5.53	1.54
Letter 17	8.11	6.72	1.39	7.13	5.97	1.16
Table 4	4.62	5.39	- .77	3.90	3.11	.79
Manuscript 1	9.82	7.84	1.98	8.50	7.21	1.29
Manuscript 15	8.18	8.58	- .40	7.95	6.21	1.74
All production tasks	7.81	7.44	.37	6.73	5.43	1.30
% gain			5.0			23.9

[a] Year 2 minus Year 1

Discussion of the findings on gains from a second year of training follows the display of error data in Table 16.

Table 16

Differences Between Year-1 and Year-2 Error Means

(Straight copy errors and production form errors)

Variable	Conventional			Programed		
	Year 1	Year 2	Diff.[a]	Year 1	Year 2	Diff.[a]
Straight copy	7.18	8.20	-1.02	6.18	8.05	-1.87
Letter 2	6.80	7.79	- .99	4.48	3.97	.51
Letter 17	4.52	4.24	.28	1.65	2.22	- .57
Table 4	11.65	8.03	3.62	3.69	4.86	-1.17
Manuscript 1	10.78	10.07	.71	6.66	5.10	1.56
Manuscript 15	3.27	3.10	.17	1.74	2.09	- .35
All production tasks	37.02	33.23	3.79	18.22	18.24	- .02
% reduction[b]			-10.2			+ .1

[a] Year 1 minus Year 2

[b] 3.79/37.02 = 10.2%, and .02/18.22 = .1%.

As shown in Tables 15 and 16, a second year of training led to gains in straight copy speed of 6-7 wpm and an increase in 3 minutes of 1-2 errors. The Year-1 and Year-2 Ss were, however, virtually equivalent in *relative* accuracy (i.e., words per error): 13.44 wpe (Year 2) and 13.31 wpe (Year 1), for the C and P trainees taken together.

Concerning production speed, conventional instruction led to a 5 percent gain (less than .4 wpm); programed instruction, to a 24 percent gain (1.30 wpm). However, the lower Year-1 speeds of the programed *S*s left more room for gains. The error data are more striking. Superficially, it would appear from the data of Table 16 that conventional instruction led to some improvement in quality of work in a second year of training (10 percent); whereas programed instruction led to a slight (and no doubt nonsignficant) decrement in work quality among second-year trainees (.1 percent). Since different trainees are involved in the two years, the consequential inference from the data of Table 16 is that programed instruction led to a level of work quality in production tasks among first-year typists as good as that found among second-year trainees. Although the Year-2 *S*s in School B had significantly lower vocabulary scores, inspection of the teacher means (in Table 26, Appendix page 100) reveals little to choose between the *S*s in the two schools. Such significant "teacher" effects as were found (Table 12) pertain to quite small differences in means as between School A and School B teachers (i.e., Teachers C and D versus Teachers E and F).[19] Thus the findings for programed *S*s in Tables 15 and 16 are little affected by differences between School A and School B trainees. With correct placement (as measured by form errors) the most important criterion of performance, it is clear from Table 16 that programed instruction among first-year trainees led to a level of work quality greatly superior to that achieved after two years of conventional instruction; form errors among first-year programed *S*s were 54.8 percent (18.22/33.23) of those made by second-year conventional *S*s: for every 20 form errors made by Year-2 conventional *S*s, Year-1 programed *S*s made 11 form errors (in the five tasks common to all *S*s).

The foregoing data provide the most striking and compelling inferences of this entire investigation: (1) Early and unremitting attention to the placement features of production tasks in first-year training (here, via programed instruction) permits confining typing instruction to one year *if* the outcomes of two years of conventional instruction are considered acceptable. Of course, those outcomes are not acceptable: an average of 6-7 form errors per production task is not "mailable" work. Accordingly, (2) Following first-year focus on production typing (e.g., via these programed materials) by a second year of training with the same focus should be expected to lead (a) to terminal performance vastly superior to that ensuing from two years of conventional instruction and (b) to absolute levels of work quality that are mailable or marketable. The less than satisfying absolute levels of work quality (and work speed), even among the programed trainees of this investigation, are probably attributable, in large part, to such factors as: inexperience of teachers in accommodating their live instruction to the programed materials, the cramming into one year of a curricular scope characteristic of two years of instruction, and the reservations of teachers about the scope of coverage insisted on by the investigator. Given appropriate modification of supporting live instruction and less tight a scheduling of topics (e.g., the six criterion tasks of the present investigation spread over 2½-3, rather than 2, semesters), marketable and even high skill might reasonably be expected after a full two years (4 semesters) of instruction among trainees like those of the present investigation. Among more able students, for the relatively simple criterion tasks of the present investigation one year of training focussed on production typing should easily lead to adequate (i.e., marketable) skill, while additional training could lead to "senior" typing skills--at more complex tasks included in the programed materials but excluded from the curriculum of the disadvantaged trainees of the present investigation.

---

[19] The significant "teacher" effects of Table 12 are for Letter 23, Table 4, and Manuscripts 1 and 15. For these four tasks mean form errors in School A (Teachers C and D) totalled 19.65; in School B (Teachers E and F), 20.40.

On the original issue of gains from a second year of training--but subject to the imprecision resulting from different trainees in the two years of instruction--a second year of conventional instruction led to nominal gains in production speed (5 percent); of programed instruction, to larger speed gains (24 percent). Production quality after a second year of conventional instruction was somewhat improved (10 percent), and the modesty of the improvement probably reflects the typical deferring of much of production typing to the second year. Among programed Ss there is nothing to choose between the production quality of Year-1 and Year-2 trainees; i.e., the latter group's first year of conventional instruction contributed nothing to the production quality that followed programed instruction in Year 2.

The findings on the major purposes of the present investigation (Questions 1 and 2, p. 41) have been given in the preceding subsection (pp. 51-62). Findings on the secondary purposes, as itemized on the lower half of page 42, follow, in turn.

Early Proficiency Following Different Amounts of Practice

As described earlier (pp. 15-16), for the first two months of programed instruction (mid-October to mid-December), one P class of each teacher worked on the program in class, under teacher supervision; the other P class(es) of each teacher worked on the program at home, each homework assignment covering a specified subsection of the program. The P teachers instantly reported that program work in class preempted virtually the entire class period, leaving little and sometimes no time on the same day for actual typing of production tasks based on the program. In contrast, the "homework" classes, following some discussion of programed placement concepts at the beginning of the class period following completion of the homework assignment, had substantially more time for actual typing practice at production tasks based on the programed placement concepts. As reported by teachers, the scheduling of program subsections for the IC (in-class) and HW (homework) Ss was kept approximately parallel by deferring the assignment of a new subsection to HW Ss until IC Ss were able to complete some actual typing based on the earlier subsection (often, not until the day after IC work on a subsection had been completed).

Test Procedures. The effects of the large differences in actual typing practice were examined via mid-December testing on straight copy (five minutes, using the same copy as in the 3-minute, June criterion testing) and on production tasks based on completed program subsections: simple business letters and simple tables, as follows: a 75-word simple business letter (see p. 118), a 150-word simple business letter (p. 119), a 37½-word, 3-column table with minor heading and column headings (p. 122), a 75-word, 4-column table with minor heading and column headings (p. 123), and parallel 37½- and 75-word tables, but without column headings (pp. 120 and 121). In each of the 16 classes of 6 teachers (those who continued with P instruction in the spring semester), the testing was conducted on one day by allocating different production tasks to different classes, as follows: the two business letters to the Year-1 classes of Teacher A, the two tables without column headings to the Year-1 classes of Teacher B, the two letters to the Year-2 classes of Teacher C in School A, the two tables with column headings to the Year-2 classes of Teacher D in School A, and the two tables without column headings to the Year-2 classes of Teachers E and F in School B. In that fashion the two business letters were typed by some Year-1 *S*s and some Year-2 *S*s; the tables without column headings by some *S*s in both years, and the tables with column headings by Year-2 *S*s only. Because Year-1 teachers could not be persuaded to teach erasing or other mode of correcting misstrokes by mid-December of first-semester instruction, all testing was conducted under no-erasing conditions and, for that reason, the work was scored for speed (completion time to the nearest quarter minute) and for form errors, but not for uncorrected typographical errors. In anticipation of some *S*s being unable to complete two production tasks (and a 5-minute timing) in one class period, for alternate *S*s in each class the two production tasks were done in short-long and long-short order (i.e., the 37½ and then the 75-word table, and vice versa; the 75- and then the 150-word letter, and vice versa). As a result, Ns for each completed production task were more equal than they would otherwise have been--since many *S*s were unable to complete the second task.

The performance scores were subjected to analysis of variance, as given in Footnote 14 (p. 40). However, since (with one exception[20]) only one teacher was involved in any given pair of production test items, analysis of variance is "one way" (for the HW and IC *S*s of that teacher), and $F = t^2$. Accordingly, for production task comparisons, *t*'s are reported, with their associated probabilities. For straight copy performance and "No. of Tasks" completed (out of a maximum of two), F's are reported, because analysis is "two way," providing measures of "Teacher" and "Interaction" effects.

Results. For the first two months of programed instruction--during which one class of each P teacher worked on the program in class, while the other class(es) of that teacher worked at home--the results of mid-December testing are shown in Table 17 (Year 2) and Table 18 (Year 1).

---

[20] The exception is for Teachers E and F in School B, all of whose classes typed the same pair of production tasks (tables without column headings). However, to keep the analyses uniform for all production task comparisons, the HW classes for the two teachers were combined into one group, and the IC classes into another. *t* tests were carried out for the resulting two groups.

Table 17

Test Statistics of Year-2 Homework and In-Class Programed Students

Variable[a]	Homework			In-Class			Probability of Obtained F[b]		
	N	Mean	SD	N	Mean	SD	Treat.	Tchr.	Interact.
SC Speed[c]	75	33.82	7.47	98	33.43	6.64	NS	NS	NS
SC Errors		12.39	11.49		14.64	13.61	NS	<.025	NS
No. of Tasks	80	1.46	.50	101	1.46	.50	NS	<.05	<.25
								t	p[b]
Short Letter									
Speed	19	21.84	7.03	22	18.63	4.04		1.821	<.05
Form		2.95	1.43		2.14	1.42		5.736	<.001
Long Letter									
Speed	19	37.79	10.57	21	36.29	5.93		.559	NS
Form		2.95	1.43		2.43	1.57		.476	NS
Short Table, w/CHs									
Speed	12	51.00	13.25	8	42.75	10.38		1.480	NS
Form		3.50	2.02		3.50	3.25		.000	NS
Long Table, w/CHs									
Speed	7	66.29	7.93	9	65.22	12.29		.199	NS
Form		3.57	2.76		4.00	2.60		.852	NS
Short Table, w/o CHs									
Speed	30	36.70	13.28	47	37.34	10.90		.306	NS
Form		2.83	1.71		3.53	2.08		1.518	NS
Long Table, w/o CHs									
Speed	29	52.41	10.55	40	54.10	12.58		.265	NS
Form		4.38	2.14		4.50	2.24		.011	NS

[a] The production test tasks are shown in Appendix pages 118-123. For the tables, w/CHs means "with column headings" and w/o CHs means "without column headings."

[b] NS means nonsignificant (at .25 for interaction, at .05 for teacher and treatment in the F tests and at .05 in the t tests).

[c] Straight copy speed is in gross words per minute, production speed in quarter minutes of completion time.

Discussion of the data on typing performance after different amounts of actual typing practice follows presentation of the findings for Year-1 Ss in Table 18 (p. 66).

Table 18

Test Statistics of Year-1 Homework and In-Class Programed Students[a]

Variable	Homework			In-Class			Probability of Obtained F		
	N	Mean	SD	N	Mean	SD	Treat.	Tchr.	Interact.
SC Speed	41	21.24	5.63	31	22.96	6.46	NS	NS	NS
SC Errors		5.78	4.13		8.26	6.44	<.05	NS	<.25
No. of Tasks	42	1.57	.50	32	1.31	.47	NS	<.001	<.001
								t	p
Short Letter									
Speed	24	27.79	7.29	9	31.44	13.54		1.003	NS
Form		2.08	1.32		3.33	3.08		1.658	NS
Long Letter									
Speed	25	46.16	11.76	8	38.38	7.69		1.821	<.05
Form		2.08	1.66		2.63	1.30		.848	NS
Short Table w/o CHs									
Speed	10	50.90	13.07	11	37.27	7.52		2.851	<.02
Form		2.10	1.97		3.27	2.15		1.265	NS
Long Table w/o CHs									
Speed	7	63.71	8.48	14	63.86	14.12		.026	NS
Form		2.57	1.18		2.50	1.24		.125	NS

[a] The footnotes of Table 17 also apply here.

In Tables 17 and 18 the larger N for "No. of (Production) Tasks" completed than for the straight copy timing reflects latecomers who missed the SC timing administered at the beginning of the period, but who arrived in time to complete at least one of the two production tasks.

With respect to task difficulty, although details are not shown here, a much larger percentage of Ss (in each year) were able to complete two business letters than were able to finish two tables, as one would expect. In fact, only 8 (of 32) Year-1 Ss were able to complete two tables in the one class period devoted to testing.

The Ns of Tables 17 and 18 are for those who completed the specified task, and the probabilities of significant differences in performance as between HW and IC Ss are based on those Ns. Also pertinent to the issue is the percentage of attendees who completed specified tasks, shown in Table 19.

Table 19

Percentage of Homework and In-Class Attendees Who Completed Each Production Task

Variable	Year 1		Year 2	
	HW	IC	HW	IC
Letter				
Short	92.3	64.3	86.4	95.7
Long	96.2	57.1	86.4	91.3
Average	94.2	60.7	86.4	93.5
Table w/o CHs				
Short	62.5	68.8	81.1	75.8
Long	43.8	87.5	78.4	64.5
Average	53.1	78.1	79.7	70.2
Table w/CHs				
Short	--	--	66.7	57.1
Long	--	--	38.9	64.3
Average			52.8	60.7

Occasional substantial differences in volume of completed output are evident in Table 19: e.g., in Year-1, more letters completed by HW Ss, but more tables completed by IC Ss; in Year-2, the reverse situation obtains. It must be remembered, however, that each of the three kinds of tasks listed in the stub of Table 19 is associated, within each year, with a different teacher. The testing design does not permit measures of treatment-teacher interaction, so that the effects of different teaching behavior on the data of Table 19 are not determinable.

As a basis for drawing inferences about the effects on performance of in-class vs. at-home work on the programed materials during the first two months of programed instruction, the data of Tables 17 and 18 are summarized in another form in Table 20 (p. 68).

One kind of variation resulting from in-class vs. at-home work at the program has already been mentioned: more actual typing practice by HW than by IC Ss. That variation might be expected to affect ordinary stroking skills, especially among Year-1 Ss whose skills were nominal (21-23 wpm). As shown in the upper section of Table 20, stroking speed was unaffected; whereas, among Year-1 Ss, significantly fewer errors were made by the HW Ss. However, the characteristically low reliability of error measures in straight copy samples as short as five minutes suggests that little importance be given to the finding just mentioned.

Table 20

Means and Significance Tests for Year-1 and Year-2 Programed Students In Homework and In-Class Classes

Variable	Year 1				Year 2			
	IC	HW	IC - HW	Treat. $p < .05$	IC	HW	IC - HW	Treat. $p < .05$
SC Speed	22.96	21.24	1.72	no	33.43	33.82	- .39	no
SC Errors	8.26	5.78	2.48	yes	14.64	12.39	2.25	no
No. of Tasks	1.31	1.57	- .26	no	1.33	1.34	- .01	no
Speed								
Short Letter	31.44	27.79	3.65	no	18.63	21.84	- 3.21	yes
Long Letter	38.38	46.16	- 7.78	yes	36.29	37.79	- 1.50	no
Short Table w/o CHs	37.27	50.90	-13.63	yes	37.34	36.70	.64	no
Long Table w/o CHs	63.86	63.71	.15	no	54.10	52.41	1.69	no
Short Table w/CHs					42.75	51.00	- 8.25	no
Long Table w/CHs					65.22	66.29	- 1.07	no
Total	170.95	188.56	-17.61		254.33	266.03	-11.70	
Form Errors								
Short Letter	3.33	2.08	1.25	no	2.14	2.95	- .81	yes
Long Letter	2.63	2.08	.55	no	2.43	2.95	- .52	no
Short Table w/o CHs	3.27	2.10	1.17	no	3.53	2.83	.70	no
Long Table w/o CHs	2.50	2.57	- .07	no	4.50	4.38	.12	no
Short Table w/CHs					3.50	3.50	.00	no
Long Table w/CHs					4.00	3.57	.43	no
Total	11.73	8.83	2.90		20.10	20.18	- .08	

Regarding differences between means for production tasks (IC - HW columns in Table 20), negative signs mean higher speeds (faster completion times) and fewer form errors by in-class Ss; positive differences favor HW Ss. The concomitants of the differential treatments (HW vs. IC) pull in opposite directions. More actual typing practice by HW Ss might lead to superior performance by them. On the other hand, Ss who worked on the program in class had the assistance of teachers, who furnished help in responding to programed frames to students who requested such help. The net effect of these two concomitants--although based on data from different Ss taught by different teachers for each of the three major classes of production tasks--is evident in Table 20. Of twenty comparisons, there were four differences that are statistically significant, all favoring in-class Ss (three for speed, one for form errors). Summing across tasks and converting completion time to whole minutes, in Year 1, in-class Ss completed their tasks in 4.4 fewer minutes than did homework Ss; in Year-2, the difference was 2.9 minutes in favor of in-class Ss. In Year 1, in-class Ss were about 10 percent faster than homework Ss; in Year 2, about 5 percent faster. Concerning form errors, which measure the dominating objectives of the programed instruction and, indeed, of vocational typing training, there was nothing to choose between the second-year HW and IC students; whereas in Year 1, the HW Ss made three-fourths the number of errors made by the IC Ss. In summary, there was a general tendency toward higher speeds among in-class Ss in both years and toward fewer errors by first-year homework Ss. The few statistically significant differences and the varying direction of differences (sometimes favoring IC Ss, at other times favoring HW Ss) suggest that the benefits of more actual typing practice among HW Ss were more or less offset by the assistance with the programed materials given IC Ss by their teachers.

Need for Teacher Supervision of Disadvantaged Students

The foregoing findings (on HW vs. IC performance) show to be groundless the fears of teachers that disadvantaged vocational high school students of below-average general ability could not (or would not) learn from programed self-instruction unless under the direct supervision of teachers. This is not to gainsay the benefits of teacher support for programed instruction when the student is in class, but merely to make apparent that in the present instance unsupervised work at the program was about as effective as directly supervised work. Accordingly, there seems no reason to preempt class time, among disadvantaged students, for monitoring self-instruction. The self-pacing of responses that is one of the defining characteristics of programed instruction makes in-class treatment of it in "group" fashion at best unwieldy and at worst impossible. Fortunately--at least in the present instance--group management over programed instruction was not found to be necessary. Even for disadvantaged students, programed instruction should be conducted as it is designed to be--independent of the teacher.

Mid-Year Programed vs. End-of-Year Conventional Performance

For the reasons given in the second paragraph of page 16, programed Ss were tested at mid-year (late January). During the three weeks of instruction that intervened between the Christmas holidays and the mid-year testing, all work on the program was done as homework (in-class work at the program was discontinued). In anticipation of late-January testing, teachers were asked to provide Ss with adequate practice at proofreading and correcting errors (by eraser or Ko-Rec-Type, at the option of the student) and had been informed that the testing would consist of business letters and tables (without column headings for Year-1 Ss, with column headings for Year-2 Ss).

The six test tasks are shown on Appendix pages 112-117 and are characterized in Footnote a of Table 21 (p. 71). The testing was conducted during one class period on one day, using four tasks in each class (the two letters and two tables in Year-1 classes, the two letters and the other two tables in Year-2 classes), each S being asked to complete two tasks (one letter and one table), plus a 3-minute straight copy timing, given first, using the same copy as in the June criterion testing. In order to maximize the chances of approximately equal Ns per task, the four production tasks were distributed to Ss in successive seats serially (about one-fourth of each class for each of the four tasks). Upon completing the first task each S was then given the test copy for the other-length other task; i.e., for fourths of the class the two tasks were: short letter/long table, long letter/short table, short table/long letter, long table/short letter. Of course, many Ss (especially in Year 1) were unable to complete the second task.

The purposes for which the January testing was conducted require comparison of results with those of end-of-year (June) testing of conventional Ss on the same tasks and, in consequence, the reporting of data only for those teachers whose conventional Ss had completed one or more of the same tasks during the earlier McLean study that furnished the scores of conventional Ss. The foregoing requirement was met for Year-1 Teacher B and two other Year-1 teachers who did not continue with P instruction in the spring semester, and for Year-2 Teachers D and F. Unfortunately--and not known at the time of selecting the mid-year test tasks--there were no conventional scores for Year-1 Ss on the long letter (Letter 23). Results are shown in Table 21 (p. 71).

Table 21

Performance Means on Mid-Year Programed and End-of-Year Conventional Testing

Variable[a]	Year 1 N[b] C	Year 1 N[b] P	Year 1 Mean C	Year 1 Mean P	Year 1 Mean C - P	Year 2 N[b] C	Year 2 N[b] P	Year 2 Mean C	Year 2 Mean P	Year 2 Mean C - P
SC Speed[c]	42	76	34.51	25.80	8.71	29	41	34.52	32.99	1.53
SC Errors			6.50	6.50	0.00			8.49	7.48	1.01
Speed[d]										
Letter 8	11	36	50.27	45.92	4.35	18	32	38.50	33.47	5.03
Letter 23						18	32	53.82	47.76	6.06
Table 2	7	27	53.43	47.11	6.32					
Table 20	9	31	74.56	65.10	9.46					
Table 12						17	30	41.00	45.85	-4.85
Table 22						14	30	65.00	71.05	-6.05
Total			178.26	158.13	20.13			198.32	198.13	.19
Form Errors										
Letter 8			7.64	1.44	6.20			2.67	2.21	.46
Letter 23								3.86	2.20	1.66
Table 2			3.43	2.67	.76					
Table 20			2.78	2.81	- .03					
Table 12								5.64	4.00	1.64
Table 22								5.80	5.41	.39
Total			13.85	6.92	6.93			17.97	13.82	4.15
Typos										
Letter 8			1.64	2.28	- .64			1.94	2.51	- .57
Letter 23								3.86	5.34	-1.48
Table 2			1.00	1.19	- .19					
Table 20			2.11	2.48	- .37					
Table 12								.57	2.87	-2.30
Table 22								3.50	4.27	- .77
Total			4.75	5.95	-1.20			9.87	14.99	-5.12

[a] Tables 2 and 20 are without column headings; Tables 12 and 22 are with column headings (37½ words in Tables 2 and 12; 75 words in Tables 20 and 22). Letter 8 has 75 words; Letter 23 has 150 words. (See Appendix pp. 112-117.)

[b] The Ns are based on the classes of three Year-1 and two Year-2 teachers. Those shown in the "Speed" section also apply to Form Errors and Typos.

[c] Gross words per minute.

[d] Quarter minutes of completion time.

The data of Table 21 are purely descriptive and were not subjected to statistical tests for significant differences between C and P Ss--for a number of reasons. Mainly, there was one consequential difference in test administration conditions that could conceivably have affected production speed; viz., carryover of incomplete tasks to the next day in June testing but not in January testing. The possible effect of that difference is to increase (by an undeterminable, but possibly small, amount) the production completion times (i.e., depress the speeds) of conventional June examinees in relation to those of January programed Ss. That aside, the principal purpose of January testing of programed Ss was to estimate the extent to which early and deliberate focus on the concepts and processes governing the form or arrangement of production tasks (in the programed instruction) could lead to results in a half-year approximating those following a full year of conventional instruction, in which production typing is deferred until later in training, accompanied by much "guidance." Purely descriptive data are felt to serve that purpose adequately.

Discussion of Results. Although ordinary copying skills, as measured by the 3-minute straight copy timing, are not the issue here, the findings given above the dashed line in Table 21 may be mentioned in passing. As is virtually ordained by the negative acceleration of the acquisition curve for stroking speed, Year-1 Ss made a substantial gain in speed (8.71 wpm) in their second semester of training: first-semester speeds are so modest that any kind of typing contributes to gains in speed. On the other hand, but equally expectable, a fourth semester of training adds little (1.53 wpm) to third-semester achievement. Concerning stroking errors, although first- and second-semester Year-1 Ss made the same absolute number of errors in three minutes (6.50), a full year of training led to greater relative accuracy (15.93 versus 11.91 words per error). Among third- and fourth-semester Year-2 Ss (i.e., P and C Ss in Year 2), the former were more accurate--absolutely and relatively (7.48 vs. 8.49 errors, 13.23 wpe versus 12.20 wpe). The surprising near identity of second- and fourth-semester stroking speeds (34.51 and 34.52 wpm of C Ss in Years 1 and 2) is accounted for by the 13 Ss of one of the Year-1 teachers (who did not continue with P instruction in the spring), who averaged 39.18 wpm. The 29 Ss of the other two Year-1 teachers in C classes averaged 32.4 wpm.

Turning to the major data on production performance (below the dashed line in Table 21), positive differences between means (in the "C-P" columns) favor programed Ss, negative differences favor conventional Ss. First-semester programed Ss were faster at all three tasks than second-semester conventional Ss, the difference (of 20.13 quarter minutes) equalling about five minutes. That difference seems greatly larger than the time that would be required for the correcting of the additional 1.20 uncorrected typographical errors made by the P Ss. In Year-2, third-semester programed Ss were faster at business letters, but slower at tables, than fourth-semester conventional Ss. Very likely, the programed S, whose training has focussed on correct placement, took the time to plan table layout more carefully; business letters, on the other hand, make fewer and simpler conceptual demands. Across all four Year-2 tasks there seems little to choose between the speeds of P and C Ss (a difference of .19 quarter minutes equals about 3 seconds). However, P Ss had an excess of 5.12 uncorrected typographical errors; correcting them would probably have added 1-2½ minutes to completion time, varying with eraser versus Ko-Rec-Type use. Accordingly, fourth-semester conventional Ss should probably be considered to be slightly faster at production tasks than third-semester programed Ss.

The foregoing speed findings are, on the one hand, somewhat uncertain because of the difference in test administration conditions mentioned earlier and, on the other, of less consequence in relation to the more important criterion of quality of work (form errors). Here, the clear superiority of the programed instruction is evident. First-semester programed Ss made half as many form errors (49.96%) as were made by second-semester conventional Ss. Third-semester programed Ss made about three-fourths the errors (76.91%) made by fourth-semester conventional Ss.

In contrast to some of the more complex tasks employed in June criterion testing (see Table 14, p. 57), some of which were lightly treated, if at all, in conventional instruction, the January test tasks were simple ones routinely included in one-year and two-year conventional training programs. The data of Table 21 strongly suggest that, with respect to the dominating criterion of quality of production typing (absence of errors not correctible by eraser--form errors, that is), early, continual, and intensive focus on placement concepts and processes can, for the simple letters and tables used here, lead to substantially superior performance in substantially less time--in contrast to the deferred production typing and excessive guidance characteristic of conventional instruction. Here, the novel medium was programed instruction. But the important point is early and deliberate focus on placement concepts and processes, whatever the medium of instruction may be.

Relationships Among Various Kinds of Performances

The relationships of interest, for the conventional and programed *S*s separately and together, are these:

1. Between vocabulary and typing performance scores (straight copy and production tasks)
2. Between straight copy and production typing scores
3. Between speed and errors in production tasks
4. Among the three classes of production tasks (business letters, tables, manuscripts) for speed, form errors, and uncorrected typographical errors

The data on the four classes of relationships enumerated above are given, in turn, below, as are the instructional questions that underlie, and the inferences to be drawn from, the data. Correlation coefficients were computed by level (Year 1 and Year 2) within treatment (conventional and programed). However, with occasional exceptions, there were few nontrivial differences between Year-1 and Year-2 correlations. Accordingly, the tabled findings are given across years, and the few instances of nontrivial "level" differences are mentioned in the accompanying discussion. All the scores are those of end-of-year (June) criterion testing, consisting of: a 3-minute straight copy timing, a 20-word vocabulary test, three business letters for P *S*s but two business letters for C *S*s, one table, and two manuscripts. Ns per task per level varied widely; therefore, the mean correlation coefficients (*r*'s) given in the tables that follow, computed by *z* transformation, were weighted by N. Since the larger Ns were for P *S*s in both years and among Year-2 *S*s in both treatments, the overall *r*'s for "both" treatments are more heavily influenced by P than by C *S*s and by Year-2 than by Year-1 *S*s.

Vocabulary and Typing Performance Scores. One issue here is that of the extent to which typing proficiency is associated with intelligence (as inferred from vocabulary scores). Might intelligence scores be a partial basis for screening candidates for advanced typing training? In contrast to earlier findings on heterogeneous students, do those for disadvantaged students support the desirability of different training techniques for such students? A second issue stems from investigations (e.g., Stolurow, 1964) that showed programed instruction to lead to "essentially zero" correlations between IQ scores and achievement measures. Are the correlations obtained here lower for P than for C *S*s? If so, then the present programed materials may be judged more efficient than is conventional instruction.

In agreement with a very large volume of earlier research (summarized in West, 1969, p. 522) showing trivial relationships between intelligence and ordinary copying skills as measured in straight copy tests, for N = 504, r's of .115 and -.050 were found between vocabulary scores and straight copy speed and between vocabulary scores and straight copy errors in the present investigation. Copying skills are largely independent of intelligence. Between vocabulary scores and number of production tasks completed during the test week, r = -.094 (N = 514). Production task data are shown in Table 22.

Table 22

Correlations between Vocabulary and Production Typing Scores
(Decimals omitted)

Variable	Range						Mean r			Mean N		
	C		P		Both							
	From	To	From	To	From	To	C	P	Both	C	P	Both
Speed												
3 Letters	-35	17	-20	04	-35	17	-08	-12	-11	35	138	91
1 Table	-22	05	-12	05	-22	05	-16	-07	-09	32	133	85
2 Mss.	-25	16	-18	06	-25	16	-08	-04	-05	85	138	90
Form Errors												
3 Letters	-38	-02	-14	02	-38	02	-13	-04	-05	35	138	91
1 Table	-18	01	-01	02	-18	02	-03	01	01	32	133	85
2 Mss.	-47	05	-13	05	-47	05	-15	-09	-10	85	138	90
Typos												
3 Letters	-62	14	-18	11	-62	14	-32	-07	-12	35	138	91
1 Table	-19	-09	-08	-01	-19	-01	-17	-06	-08	32	133	85
2 Mss.	-47	05	-13	-05	-47	05	-18	-08	-10	85	138	90
All Tasks												
Speed	-35	17	-20	06	-35	17	-10	-08	-09	38	137	90
Form Err.	-38	01	-19	02	-38	02	-12	-05	-06	38	137	90
Typos	-62	05	-18	11	-62	11	-24	-07	-10	38	137	90

Production speed was measured by completion time; accordingly, the negative r's with speed mean that as vocabulary scores increased, completion time decreased (i.e., production speed increased). For errors (form and typos), negative signs show increases in vocabulary going with decreases in errors. Although the mean *r*'s are in the anticipated direction, none of them is large enough (in relation to the mean Ns) to differ significantly from zero, using p = .05. Earlier studies of heterogeneous trainees (e.g., Cook and Appel, 1941) reported correlations between IQ and production typing scores of up to .81. For the present disadvantaged *S*s, however, there was substantial restriction of range in the vocabulary scores (low of 2, high of 15, with about 95 percent of all scores between 3 and 13). Another explanatory factor arises from the established generalization that in complex tasks individual differences increase with practice (Anastasi, 1934). The below-average abilities of the present trainees probably led to relatively limited amounts of practice (i.e., number of different typing tasks completed during the training). Thus, production typing scores were also probably restricted in range. The present low correlations no doubt reflect, in part, substantial restriction of range in both variables (vocabulary and production skill). Even so, there is no present evidence that intelligence is useful in screening disadvantaged trainees for vocational typing courses. Firmer data require, at a minimum, sufficient practice to widen the range of production typing scores.

Concerning the typical finding of at least moderate correlations between aptitude and achievement following conventional instruction, it has been held that such relationships reflect instructional inefficiency--the inability in mass instruction for the "live" teacher to take into account in his teaching the various pertinent individual differences among students. With more adequately individualized (e.g., "programed") instruction, studies such as those of Stolurow (1964) found "essentially zero" correlations. Inspection of the mean *r*'s for the C and P *S*s in Table 22 shows the shift to be, in 11 of 12 instances, in the predicated direction: the mean *r*'s for P *S*s are, with one exception, below those for C *S*s. The various Ns that underlie the mean r's preclude testing whether the differences are statistically significant; the near-uniform direction of these differences is, however, apparent. In the present context of individualized instruction reducing relationships between aptitude and achievement, it seems probable that the learning sequences of the present programed typing materials were more "efficient" than those of conventional, live instruction. Efficiency, here, is in relation to aptitude correlations, not to the achievement of marketable typing skills.

Straight Copy and Production Typing Scores. As described earlier, conventional instruction, especially of disadvantaged students, tends to give substantial attention to ordinary copying skills. Among heterogeneous students, the assumption would appear to be that such skills contribute appreciably to proficiency at realistic vocational typing tasks; among students of below-average ability it is perhaps assumed, as well, that their capacities preclude mastery over the more consequential typing tasks. A summary of the earlier evidence on relationships between straight copy and production typing proficiency among heterogeneous high school and college students (West, 1969, p. 330) showed moderate correlations for speed and low correlations for errors (under no-erasing conditions). The present findings on this issue are displayed in Table 23.

Table 23

Correlations between Straight Copy and Production Typing Scores
(Decimals omitted)

Variable	Range						Mean r			Mean N		
	C		P		Both							
	From	To	From	To	From	To	C	P	Both	C	P	Both
SC Speed with												
Letter Speed	-63	-21	-31	05	-63	05	-36[a]	-23[c]	-25[b]	35	136	90
Table Speed	-09	02	-17	-03	-17	02	-06	-13	-11	37	132	84
Ms. Speed	-47	-23	-31	-15	-47	-15	-35[a]	-24[c]	-26[a]	42	137	65
All Tasks	-63	02	-31	-15	-63	02	-31	-22[c]	-23[a]	38	136	89
SC Errors with												
Letter Speed	-12	05	-24	26	-24	26	-04	05	04	35	136	90
Table speed	08	19	-06	01	-06	19	11	-12	03	37	136	90
Ms. Speed	-25	21	-12	15	-25	21	09	02	-01	42	137	65
All Tasks	-25	21	-24	26	-25	26	-04	03	02	38	136	89

[a] Significantly different from zero at the .05 level.

[b] Significantly different from zero at the .02 level.

[c] Significantly different from zero at the .01 level.

Again: with SC (straight copy) speed measured in words per minute but production speed in completion time, negative speed correlations in Table 23 mean that as wpm increases, production completion time decreases (i.e., production speed increases). The mean r's for speed-with-speed in Table 23 show rather more transfer of SC stroking habits to letter and manuscript typing than to table typing--a finding that is quite to be expected from the continuous prose character of letters and manuscripts, but not of tables. The more the production task content consists of the continuous prose of straight copy typing, the more will straight copy skills contribute to production speeds. Even for such tasks, however, the obtained r's are low--well below those found among highly trained high school and college typists of heterogeneous ability. Also, although the nature of the data precludes statistical tests for significance of differences between the mean r's of C and P Ss, it may be noted for letters and manuscripts (the two tasks to which the issue applies) that the r's are lower for P than for C Ss. For the conventional trainee, given little explicit instruction in making placement decisions, his production speed depends more heavily on ordinary stroking speed than does that of the trainee given explicit placement instruction and practice in making placement decisions. Put another way: as the thinking through of the placement decisions enters more prominently into production typing, the role of ordinary stroking speed is reduced.

Correlations of SC errors with production errors are not reported because they have no logical relationship. Misstrokes are wholly independent of the kinds of mental processes that apply to form errors, and there can be no interest in whether misstrokes under no-erasing (SC) conditions are associated with uncorrected misstrokes (typos) under the erasing conditions of production typing. In Table 23, correlations between SC errors and production speed are shown because, if the stroking habits of SC typing are also used in production typing and if production misstrokes are to be corrected, then the more production misstrokes the longer the production completion time. As shown in Table 23, the obtained r's are trivially small--a finding that suggests that the stroking habits bearing on accuracy in SC typing are not the ones used in production typing and that the conventional extreme focus on stroking accuracy in straight copy typing (during training and in employment tests) is seriously mistaken. That inference is more directly supported by error correlations under no-erasing conditions for both tasks and by the characteristically low reliability of measures of SC errors. The present data merely add tangential support to the earlier direct evidence, as summarized by West (1969, pp. 330, 296).

Production Speed and Errors. Does the faster production typist tend to do work of higher quality? For straight copy typing, data on thousands of typists in dozens of studies (summarized in West, 1969, p. 238) show the two criteria to be virtually uncorrelated, i.e., about as often very low negative as very low positive. For the present Ss, the r for straight copy speed and errors was .08 for both C and P Ss, little different from the r of .14 found among typists covering the full range of copying skills from 9 through 108 wpm (West, 1969, p. 238). For the realistic vocational typing tasks of "production" typing, four earlier studies (see West, 1969, p. 398) reported speed-error r's ranging between .08 and .52. The findings for the present Ss are displayed in Table 24.

Table 24

Correlations between Production Speed and Errors
(Decimals omitted)

Variable	Range						Mean r*			Mean N		
	C		P		Both							
	From	To	From	To	From	To	C	P	Both	C	P	Both
3 Letters												
Form	-11	20	-23	19	-23	20	03	06	05	37	140	93
Typos	-30	22	-09	48	-30	48	-08	17	14	37	140	93
1 Table												
Form	-04	07	07	10	-04	10	-08	09	05	39	136	88
Typos	-46	-05	-29	-05	-46	-05	-19	-13	-14	39	136	88
2 Mss.												
Form	-14	12	01	08	-14	12	00	06	04	46	141	94
Typos	-15	13	-33	13	-33	13	-05	01	00	46	141	94
All Tasks												
Form	-14	20	-23	19	-23	20	00	06	05	41	140	92
Typos	-46	22	-33	48	-46	48	-08	07	04	41	140	92

*None of the mean r's is significantly different from zero.

With few exceptions, the mean r's of Table 24 are near zero, and none differs significantly from zero. Speed at production tasks is essentially independent of that aspect of work quality bearing on attractive arrangement of materials on the page (form errors). "Typos" are not number of misstrokes, but number of uncorrected misstrokes. However, purely probabilistically, the more misstrokes, the more of them that can be overlooked. Also, a typist could be faster because he does not take the time to correct misstrokes, or slower because he does correct mistakes. The near-zero r's for "typos," as for form errors, show no tendency in either direction. Speed and quality seem essentially independent--at least among the present low-ability Ss.

Intertask Relationships. If there is overlap in the processes applicable to typing the various vocational tasks, transfer of skills from one kind of task to another should be expected; and if the commonalities in task processes are accurately identified and there is deliberate "teaching for transfer," training time can be economized. The pertinent data are shown in Table 25.

Table 25

Median Intercorrelations Among Production Tasks[a]

(L = Letter, T = Table, Ms = Manuscript; Decimals omitted)

Task	C			P			Both		
	Ls	T	Mss	Ls	T	Mss	Ls	T	Mss
Speed									
Letters	22	27	40*	23*	16	20*	23*	17	22*
Table			22			16			17
Manuscripts			26			08			10
Form Errors									
Letters	51*	62*	38	44*	47*	46*	44*	49*	45*
Table			45*			42*			43*
Manuscripts			-11			45*			38*
Typos									
Letters	59*	36	34	46*	31*	27*	46*	32*	28*
Table			31			40*			39*
Manuscripts			10			34*			31*

[a] From left to right across the rows, the mean Ns are--Letters row: 20, 24, 24, 124, 120, 126, 98, 82, 85; Table row: 25, 122, 74; Manuscripts row: 16, 124, 72.

*Differs significantly from zero (i.e., $p < .05$ to $< .01$).

In Table 25, some of the *r*'s among conventional trainees are higher than the corresponding *r*'s for the programed trainees, but fall short of differing significantly from zero only because of the smaller Ns on which they are based (see Footnote *a*). That aside, the correlation coefficients of Table 25 confirm what is more or less to be expected. The tasks whose content consists substantially of continuous prose and whose placement decisions are largely confined to the determining of margins (viz., letters and manuscripts) show greater agreement with each other than either of the two do with tables. Tables, uniquely, add internal decisions about the location of tabular stops for columns and the centering of column headings, as well as the alignment of digits in columns. The two manuscripts show relatively less agreement with each other than one might, superficially, expect. However, one of the two manuscripts contained features not present in the other one: editorial corrections and footnoting. Clearly, the more the overlap in task features (and, therefore, in placement processes), the higher the intertask correlations. In general, the extent of overlap in the six criterion tasks (3 business letters, 1 table, 2 manuscripts)--for the present *S*s--may be characterized as low to moderate and tending to be higher for placement processes (form errors) than for speed of work. The tendency to proofread and to correct misstrokes (i.e., "typos") was more in evidence for letters than for the other two tasks.

Differences between the *r*'s for P and C trainees--although not susceptible to statistical tests of signficance--bear on the deliberate attempt in the programed materials to teach for transfer, resulting in a substantially smaller range of form-error *r*'s among the P trainees (from .42 to .47) than among C trainees (from -.11 to .62). Clearly, the programed materials led to levels of agreement among scores substantially less variable than those found among conventional trainees. The programed instruction seems to have accomplished its objective of transfer of applicable placement processes among tasks. Conventional instruction, it may be inferred, tends more often to treat each kind of task as unique; commonalities among placement processes are not routinely and deliberately pointed out to trainees.

Finally, there were a few instances of nontrivial differences between Year-1 and Year-2 *r*'s--about as often in one direction as the other among both P and C trainees. The more general data of Table 25 and the inferences drawn from that data are unaffected.

Judgments of the Programed Instruction by Teachers and Chairmen

The subjective impressions of teachers about various aspects of the programed instruction were solicited via questionnaire at the end of the year. The chairman of the Secretarial Studies Department in each of the two participating vocational high schools was also asked to comment, by letter to the investigator, on any aspect of the instruction, using the teacher's questionnaire as an approximate indicator of the issues of interest. Their comments tended to be in general accord with the questionnaire responses of teachers. Some of the questionnaire findings were given in the "Procedures" section of this report. Other findings are given here, and the questionnaire is reproduced on pages 103-105.

The present findings apply to eight teachers: the six involved in the full-year instruction, plus two other teachers in School A (one Year-1 and one Year-2 teacher) who replaced the fall-term teachers who left or were reassigned. The two replacements were involved only in spring-term programed instruction of Ss whose earlier fall-term programed instruction had been in classes of the teachers who left at the end of that semester. However, the one-semester experience with programed instruction of the two new teachers is felt to have furnished as adequate a basis for judgment as did the full-year experience of the other six teachers. The test papers of Ss in the four classes of the two new teachers were not scored, however, because those teachers had not been involved in the earlier McLean investigation that furnished the scores of conventional Ss; i.e., for those teachers there were no C scores against which P scores could be assessed. The two teachers were not so informed, however; they and their classes were treated throughout precisely as were the other six teachers and their classes, including full June criterion testing.

Questionnaire Item 3 (p. 103) asked for estimates of the percentage of students with various attitudes toward the program (unfavorable, neutral, favorable). Among the eight teachers, estimates of unfavorable attitudes ranged from 10 to 95 percent, averaging 65 percent; neutral attitudes ranged from 5 to 50 percent, averaging 20 percent; favorable attitudes ranged from 0 to 50 percent, averaging 15 percent. Put another way, of every 20 P trainees, 13 were judged to have unfavorable attitudes, 4 to be neutral, and 3 to have favorable attitudes. With values of 1, 2, and 3 assigned to the attitudes (from unfavorable through favorable), the mean was 1.50--halfway between unfavorable and neutral.

Questionnaire Item 4 (p. 103) asked for estimates of program suitability to students (highly suitable, moderately suitable, unsuitable). Responses approximately paralled those for student attitudes--as might be expected, since attitudes and suitability are correlated phenomena. Specifically, the programed frames were judged to be unsuitable for 10 to 85 percent of Ss, averaging 71 percent; moderately suitable ranged from 10 to 40 percent, averaging 18 percent; and highly suitable applied to 0-60 percent of Ss, averaging 11 percent. With slight rounding of these estimates, the judgment were that of every 20 P trainees the program was unsuitable for 14 of them, moderately suitable for 4, and highly suitable for 2 students. With values of 1, 2, and 3 assigned to the estimates (from unsuitable to highly suitable), the mean value of 1.41 is two-fifths of the way between unsuitable and moderately suitable.

The general tenor of these estimates (about student attitudes and program suitability) is markedly negative and, however subjective, cannot be regainsaid. Even so, some emotionalism and lack of discrimination in the responses of some teachers is evident. It is hardly likely, for example, that no student in a pair of classes had favorable attitudes toward the program; yet, one of the eight teachers (with 50+ students on register in two classes) so estimated. Similarly, two of the eight teachers (100+ Ss on register in four classes) estimated that there were no students for whom the program was highly suitable and only ten for whom the program was moderately suitable. Extremes such as those cited contradict reasonable probabilities and cannot be taken seriously. In view of the perceptions and expectations of six of the eight teachers concerning student abilities and attitudes toward homework (as given in the "Procedures" section), it may be that, to some undeterminable extent, the present estimates represent a self-fulfilling prophecy, revealing teacher attitudes as much as they do student attitudes.

The foregoing conjecture deserves some exploration, admittedly speculative. The disadvantaged Ss of the present investigation are not "readers"; they have been trained throughout their school experience to expect instruction to be largely at the hands of the teacher, gotten "through the ears" and from the blackboard. Insofar as thinking about what one reads is hard work, such students are not overjoyed with instruction that requires thought on their part. In turn, teachers of such students probably reinforce student expectations about instruction and, indeed, account in no small part for those expectations. One teacher, in fact, confessed to the investigator personal resentment at the preempting of a consequential portion of that person's normal teaching activities by the programed materials. Inexperience in accomodating their live instruction to the programed portion of it is another factor bearing on teachers' estimates of program suitability and student attitudes, and the rather too full curriculum imposed by the investigator on both Year-1 and Year-2 trainees is also pertinent. Given more teacher experience with programed instruction and deeper training in using such materials, plus modification of teachers' stereotypes about disadvantaged students and concomitant revision of instruction away from interminable "guidance" for relatively trivial tasks and toward "confirmation" techniques applied to more consequential tasks, teacher and student attitudes might well be appreciably improved. The present programed materials were hard work indeed, for both students and teachers. However, the resulting proficiency at the vocational typing tasks of the present investigation, in relation to the outcomes of conventional instruction, show the effects of the programed instruction to have transcended the attitudes reported by teachers.

Teachers were also asked (Questionnaire Item 5, p. 103) to specify the sections of the program that students found most difficult. All eight teachers listed various subsections of Section 9 (Advanced table typing) as most difficult, and five of the eight also mentioned one or another of the earlier sections on simple tables (Sections 5-8). Four of the eight teachers included manuscript typing (Section 14) as among the half dozen most difficult topics. Despite the particular wording of the question, responses refer to the task, not to the programed treatment of it. Table typing is notoriously the most difficult vocational typing task, whatever the medium of instruction; and manuscript typing was new to the curriculum and to these teachers--not included in earlier conventional instruction. That "difficulty" was to some extent confused with "novelty" is evident in the specification by one teacher of backspace methods of typing tables as among the more difficult topics. Backspacing is much simpler than arithmetic methods and is, indeed, the only method of table typing taught in one of the country's leading typewriting textbook, one that studiously excludes the more complex tables for which backspace methods are wholly inadequate. Backspace methods are simple, and they apply to simple tables--but that method was new to the teacher in question, as it was to all eight teachers, who had previously taught only arithmetic methods of planning the horizontal layout of tables. For students routinely characterized by their teachers as exceptionally weak in arithmetic, the conventional use of arithmetic rather than nonarithmetic methods of table placement illustrates the failure to modify instruction in accord with student characteristics.

In other instances of topics characterized as difficult, the tasks were familiar, but the program's procedures for executing those tasks differed to greater or lesser extent from those familiar to teachers (e.g., placement of business letters).

Teachers were also asked (Questionnaire Item 10, p. 104) what program procedures they felt were superior to the ones they had employed in their earlier conventional instruction. Mentioned, with frequencies in parentheses, were: business letter placement, i.e., procedures for determining vertical and horizontal margins (5), estimation of copy length (4), lavish use of longhand rather than perfectly printed copy for typing (2), manuscript typing (2), and backspace methods of table placement (1).

They were also asked (Question 12, p. 105) about their future intended inclusion of topics and use of placement procedures that were contained in the program (to a considerable extent, to some extent, not much). Of the eight teachers, responses were equally divided between "not much" and "to some extent." It is perhaps amusing to note that three of the four "not much" respondents had specifically listed a number of program procedures they felt were superior to their usual ones (Question 10).

Finally (Question 16, p. 105), teachers were invited to comment freely on any aspect of the programed instruction. Five of the eight teachers accepted the invitation. Excepting the few irrelevant or factually incorrect comments (and including those in the chairmen's letters to the investigator), the pertinent ones were:

1. Too much work in too little time; students felt breathlessly rushed.
2. Our pupils do not work well under pressure; they become jittery.
3. The skills taught were beyond the comprehension of [our] pupils.
4. The program required reading comprehension that pupils did not have.
5. The program is more suitable to brighter or college students--probably a good one for students of average or higher ability.

6. [High school students] do not willingly do homework.

7. Pupils are accustomed to teacher [emphasis mine] explanation, repetition and review.

8. The program's procedures for typing are good for the teacher--to use in teaching verbally. These kids want the teacher to teach; they don't want to read.

9. The need for close concentration [on the programed frames] was just too much for many students.

10. The precision of the program's placement procedures perhaps made pupils conscious of minutiae at the expense of broader concepts.

11. Teaching more than one placement procedure for a given type of task [e.g., backspace and arithmetic table planning methods, moving and fixed datelines in letters, pica and elite type] confuses students. Better to teach such students one and only one way to do things.

12. Any kind of arithmetic [e.g., for table placement, estimation of copy length] is too much for these students.

13. For the many clerical and bookkeeping majors, "interest in typing is at best peripheral."

14. [From one chairman] There was a great deal of teacher resistance to the program; some were never "sold" on it. There were too many topics to be covered, with inadequate time for application. Teacher paper work and clerical chores were also a burden.

15. Pupils were achieving better in judgment areas than former pupils of these teachers had done [because] pupils were forced to use their own judgment and not rely on their teachers.

The foregoing comments are given almost verbatim, and No. 15 strikes to the heart of what instruction aimed at marketable vocational typing skills is all about. Even so, the program is probably not well suited to low-ability trainees. The highly favorable typing performance outcomes of the programed instruction were perhaps accomplished by brute force--by a level of effort that probably cannot be routinely expected short of a revolution in teachers' perceptions of low-ability students and in the modes of teaching such students characteristic of all their schooling. One principal requirement, in the judgment of the investigator, is the replacement of pap with substance, of trivial skills for which there is no market with skill at real-world tasks. Another is gross reduction in the amount of leading by the hand, coupled with explicit teaching of pertinent concepts and ample practice in applying those concepts without continuous assistance--an assistance that is rarely available in real life once formal training has been completed.

Finally, it is regrettable that an opportunity to test the programed instruction on heterogeneous students, including ones of average and higher general ability, could not be arranged. Conceivably, the program would be found to be well suited to the average student. For such students, bypassing the substantial amount of live instruction devoted to the placement concepts of vocational typing tasks (by home study of materials such as the present ones) could result in important economies in training time and/or in higher proficiency resulting from more time available for practice at the typewriter in applying placement concepts to realistic vocational typing tasks.

Summary of Findings, Conclusions, and Recommendations

As a basis for enumerating the specific findings of the present investigation and the conclusions and recommendations that flow from the findings, the major purposes and characteristics of this investigation are first summarized briefly.

Chiefly at issue are the relative effects on proficiency at vocational typing tasks of conventional versus programed instruction, applied to low-ability first-year and second-year typing trainees in two vocational high schools. The programed instruction was conducted for a full school year in four first-year classes of two teachers and in twelve second-year classes of four teachers. Outcomes were contrasted with those following conventional instruction among students of comparable general ability in the classes of the same teachers in the same schools two years earlier (three first-year and nine second-year classes). For first- and second-year instruction respectively, findings are based on 45 and 168 conventional students and on 109 and 225 programed trainees.

The real variables under investigation are represented by the characteristics of the two contrasted instructional modes. Conventional instruction had the following leading characteristics:

1. Substantial focus on ordinary copying skills of the kind measured in straight copy tests.
2. Relatively late introduction of vocational typing tasks.

3. Restriction of vocational typing tasks to the simplest ones (viz., simple business letters and simple tables).

4. Instruction wholly teacher mediated (oral and blackboard), accompanied by much teacher guidance for student responses into late stages of training.

5. Teaching of one procedure for a given kind of task, by rote and not strongly accompanied by "whys and wherefores."

6. Student practice almost entirely from perfectly printed materials.

In contrast, the programed instruction had the following characteristics:

1. Substantially less practice given to ordinary copying skills.

2. Early (middle of October) introduction of realistic typing tasks.

3. Coverage of a wide range of task difficulty, indentically in first- and second-year classes.

4. Deliberate instruction, via "home" work on linear programed "frames," dealing with the concepts and procedures governing attractive placement or arrangement of typed materials on the page, followed, in class, by practice at the typewriter in applying the placement concepts and procedures to representative tasks (here: business letters, tables, and manuscripts). Practice and test materials following completion of a subsection of the program were wholly "unarranged," unaccompanied by specific placement information, and required the student to make his own decisions about margins, tabular stops, et al., without teacher assistance. The chief roles of the teacher were to monitor the completion of programed subsections by students and to furnish ample practice at the typewriter.

5. Teaching, when applicable, of more than one procedure for typing a given task (e.g., both backspace and arithmetic methods of table planning, both moving and fixed date lines in business letters).

6. Large amounts of student practice from the longhand materials that predominate in real-world typing activities.

In addition, the programed materials incorporated the step-by-step sequencing of events and the individualization of instruction that is nearly impossible to achieve to comparable degree in live (oral) conventional teaching.

Programed students were tested at mid-year on simple business letters and tables. All trainees, both conventional and programed, were tested at the end of the school year on the same tasks: a 20-word vocabulary test used as a measure of general ability, a 3-minute straight copy timing on prose of average difficulty, a 150-word letter that included a 3-column table with column headings, a 75-word letter including an enumeration, a 150-word simple business letter, a 4-column table with one 2-line and three 1-line column headings, a 150-word manuscript including one footnote and editorial corrections, and a 75-word simple prose manuscript without special features.[21] The six production tasks were scored for speed (completion time), for errors in form or arrangement of materials on the page (form errors), and for uncorrected typographical errors ("typos"). All production test copy was unarranged, and students were required to make their own placement decisions and to correct mistakes (by eraser or Ko-Rec-Type).

Findings, Conclusions, Recommendations

The principal findings are given below, with details presented on the pages of this report given in square brackets. Each finding or group of findings is followed by conclusions and recommendations. The objective of the programed instruction (and, indeed, of vocational typing training) makes "form errors" the principal criterion of proficiency, with speed of work secondary. Neither mode of instruction, conventional or programed, had any direct differential bearing on proofreading and correction of misstrokes; accordingly, uncorrected typographical errors were not expected to be differentially affected by the two contrasted instructional modes.

As a preliminary to the findings on performance, the students in the C (conventional) and P (programed) classes did not differ in general ability (as inferred from vocabulary test scores) and were of below-average general mental ability [pp. 43-45]. Accordingly, the results may be attributed to the instructional modes, uncontaminated by differences in student aptitudes.

Straight Copy Proficiency. Despite substantially less practice at ordinary stroking skills in P (programed) classes, neither in Year 1 nor in Year 2 did P and C students differ significantly in straight copy performance, as measured by gross words per minute and number of errors [pp. 52-53, 59]. In addition, straight copy speed was little correlated (r = -.23) with production speed (completion time); and straight copy accuracy was uncorrelated with production speed (r = .02). [pp. 79-80]

Conclusion 1. The conventional assumption that ordinary copying skills make an important contribution to proficiency at vocational typing tasks and the consequent substantial attention to copying skills throughout training are seriously in error. Three inferences seem appropriate: (a) Vocational proficiency depends mostly on decision-making about the placement of materials on the page; (b) The stroking habits of straight copy typing are not identical to those of production typing--probably because of differences in the typist's "set" or perception of the requirements of the two kinds of tasks; and (c) The characteristic negative acceleration of the acquisition curves for copying speed and errors suggests that the levels of copying skills typically found at the earlier stages of training are so modest that any kind of typing practice (e.g., at realistic vocational tasks) contributes to gains in ordinary stroking skills.

---

[21] It was found, upon readying data for statistical analysis, that there were no scores on record for first-year C students for the 150-word simple business letter. Accordingly, results for Year-1 trainees are based on five rather than six production typing tasks.

Recommendation 1. Drastically reduce the conventional focus on ordinary copying skills of the kind measured in straight copy tests. Such skills contribute little to proficiency at realistic vocational tasks and do not suffer when the bulk of training is devoted to vocational skills.

Production Typing Proficiency. Findings on production proficiency are given, in turn, for first- and second-year trainees, for both years together, and for less programed instruction in contrast to more conventional instruction. [pp. 51-62, 70-73]

a. Among the five Year-1 terminal production tasks, C (conventional) students were significantly faster than P (programed) trainees in two instances (table and letter with table), whereas P students made significantly fewer form errors in each of the five tasks. There were no significant differences in number of "typos." Summing across all five tasks, C students completed them in 73 percent of the time required by P trainees (70.6 vs. 96.7 minutes--7.44 vs. 5.43 words per minute). Form errors by P students were 49.2 percent of the number made by C trainees (18.22 vs. 37.02). [pp. 51-59]

b. Among six Year-2 production tasks, C students were significantly faster than P trainees in two instances (table and letter with table), but made significantly more form errors in each of the six tasks. One of the six differences in "typos" was statistically significant, favoring C students. Summing across tasks, C trainees completed them in 87.5 percent of the time required by P students (80.70 vs. 90.25 minutes--8.36 vs. 7.32 words per minute). Form errors by P students were 55.5 percent of the number made by C trainees (20.20 vs. 37.09). [pp. 51-59]

c. Summarizing across both years, of 11 task comparisons, there were four significant speed differences, favoring C students; whereas P trainees made significantly fewer form errors in all 11 instances (the largest differences being found for the table and for the manuscript containing a footnote). At the cost of a 27 percent reduction in speed among Year-1 trainees and of 12½ percent among Year-2 students, programed instruction reduced placement or form errors by nearly half (38.42 vs. 74.11). [pp. 58-62]

d. First-year programed instruction led to a level of work quality greatly superior to that achieved after two years of conventional instruction: for every 20 form errors made by Year-2 C students, Year-1 P trainees made 11 form errors (on the five tasks common to both years). [pp. 58-62]

e. Contrasting first-year and second-year performance among C and P students, production speed among C students in Year-2 was only .37 wpm above that of first-year students; among programed trainees, the gain was 1.30 wpm. On the other hand, among conventional students form errors in Year 2 were 10.2 percent below those of Year 1; whereas among P students the difference was .1 percent. It is apparent that among Year-2 programed trainees their first year of conventional instruction contributed nothing to the production quality (form errors) that followed programed instruction in their second year. In other words, for quality of work, programed instruction in Year 1 was as effective as Year-2 programed instruction that had been preceded by a year of conventional instruction. [pp. 58-62]

f. Programed students were tested at mid-year (January) under conditions that tended to inflate their speed scores (in relation to end-of-year scores) but that could have no differential effect on errors. Comparison of mid-year P scores with end-of-year C scores (3 tasks in Year 1, 4 tasks in Year 2) had results as follows: In Year 1, P students after one semester of instruction completed 3 tasks in 5 fewer minutes than did C students after a full year of instruction, and they made greatly fewer form errors (P = 6.92, C = 13.85). In Year 2 there were no speed differences between half-year P students and full-year C trainees, whereas P trainees made fewer form errors (P = 13.82, C = 17.97). [pp. 70-73]

Conclusion 2. Early introduction of and continual focus on the concepts and procedures applicable to the placement features of vocational typing tasks (here, via programed instruction), accompanied by practice in applying those procedures to realistic tasks, without teacher assistance, is markedly superior to the conventional practice of deferring vocational typing tasks until relatively late in training, accompanied by large amounts of teacher (or textbook) assistance in making placement decisions. Indeed, the former tactic--among low-ability students, at any rate--led to nearly 50 percent improvement in work quality in about half as much training time.

Recommendation 2. Vocational typing training should (a) drastically reduce the amount of attention given to ordinary copying skills; (b) introduce vocational tasks very early in instruction (perhaps by mid-October); (c) give students, from the start, explicit instruction in the procedures governing attractive arrangement of typed products, accompanied by ample practice in applying placement procedures to realistic, unarranged materials (preferably in longhand), without teacher guidance. Strenuously to be avoided is interminable teacher assistance in making placement decisions. These recommended tactics more or less reverse those of conventional instruction. Particularly, the "clerical" training programs common among low-ability students result in skills that have little marketable value and should be replaced by ones of genuine vocational value--even if confined to the simpler tasks rather than covering a wide spectrum of task difficulty.

Role of the Teacher in Programed Instruction. Teachers reported that students found the programed materials difficult and that much live explanation and reteaching of the programed placement concepts were required. Indeed, they estimated outcomes to be due more to their support of the program than to the program itself (Program 25%, Live Teaching 75%). However, among nine end-of-year test comparisons, only one significant difference was found between frequently absent (18.19 days) and infrequently absent (5.56 days) students--in a 72-75 day spring semester. [pp. 48-51]

Conclusion 3. Whatever the contributions to outcomes of live teaching support for the programed instruction, they were clearly less than teachers estimated. The frequent absentee who performs as well as the infrequent absentee must have learned from his programed homework.

Recommendation 3. Programed materials progressively move from heavily guided or prompted frames to unguided "test" frames--here, under wholly paper-and-pencil conditions for placement concepts and processes. The appropriate post-program teacher behavior is to supply opportunities for actual typing requiring application of placement procedures--not heavily guided oral reexplication of placement procedures prior to typing. Teachers' tendencies to extrapolate the difficulties of the few to the many is particularly to be guarded against. (See, also, Recommendation 4, below).

Teacher Judgments of Student Attitudes and Program Features. Concerning the programed instruction used as the particular vehicle for implementing the instructional tactics described in Recommendation 2, above, the subjective judgments or impressions of teachers and department chairmen were solicited via formal questionnaire and informal letter. Findings were [pp. 82-87]:

a. Of every 20 programed trainees, 13 were estimated to have unfavorable attitudes toward the program, 4 were neutral, and 3 were judged to have favorable attitudes. The average judgment was halfway between unfavorable and neutral.

b. Judgments of the suitability of the programed instruction for low-ability trainees paralleled those for student attitudes. Of every 20 P students, the program was judged to be unsuitable for 14, moderately suitable for 4, and highly suitable for 2. The average judgment was two-fifths of the way between unsuitable and moderately suitable.

c. Table typing was judged to be the most difficult task, while the teaching of manuscript typing was novel to teachers.

d. The program's placement procedures were felt to be superior to the ones employed in earlier conventional instruction with respect to: business letter placement, estimation of copy length, lavish use of longhand materials, manuscript typing, and backspace methods of table placement.

e. Unstructured comments heavily stressed the low reading and arithmetic abilities of their disadvantaged students, the over-full curriculum imposed by the investigator, the resistance of disadvantaged students to working under pressure and to homework, and, especially important, the expectation of such students, built in over years of schooling, of oral instruction from the teacher rather than of concentrated attention to written instructional materials that require thought.

f. In general, it was judged that the program would be a highly appropriate one for students of at least average ability.

Conclusion 4. The particular programed materials used here are probably not optimally designed for low-ability students without extensive live teaching support (but see the preceding subsection on "Role of the Teacher . . ."). However, terminal production proficiency following the programed instruction (see above) suggests that the instruction transcended the negative student attitudes and was not unmanageably beyond the modest abilities of students. Especially evident, by inference from the findings on proficiency in relation to student attitudes, is the predominance of acquisition variables over motivational ones. "You don't have to love it to learn it."

Recommendation 4. The comments of teachers and direct observation of their teaching by the investigator suggest that more effective use of these (or any) programed instruction among low-ability students requires modification of teacher stereotypes about such students and, among all students of whatever level of general mental ability, explicit training of teachers in accommodating their live instruction to the programing of parts of it. Particularly needed among teachers, especially of low-ability students, is restraining the tendency to behave as if little learning is possible except via the agency of their live instruction. The consequence of redundant oral re-explication of programed instruction is to bore the more able students and to reduce the attentiveness of all students to the programed materials. "Why work on the program if the teacher is going to explain it all anyway?"

A number of ancillary findings, associated with secondary purposes of the investigation, follow.

Supervised vs. Unsupervised Work at Programed Materials. To test the predictions of participants that their low-ability students required direct teacher supervision over their work at the program, for the first two months of programed instruction (mid-October through mid-December), one class of each P teacher worked on the program in class, under the supervision and with the assistance of the teacher; the other class of each P teacher worked on the program as homework. (Thereafter, homework applied to all students.) Among six mid-December production test tasks, for only one task were there significant differences (favoring Year-2 in-class students). Among Year-1 trainees, two of four speed differences significantly favored in-class students, with no form-error differences on any of the four tasks. [pp. 63-69]

Conclusion 5. The initial fear of teachers and chairmen that their low-ability students would not responsibly work on the program at home or learn from it without the teacher's assistance was largely unfounded. Study of programed materials by low-ability students benefits little from teacher supervision and assistance. Besides, programed materials are designed to be self-instructional and are, by definition, self-paced. In-class use of such materials on a group basis is unwieldy and unmanageable because of variations in work time--as was instantly reported by teachers.

Recommendation 5. Efficient management of programed instruction and preservation of its consequential features mandate the assignment as homework of a specified portion of the program, which all students work on at their own rates. In-class activities following completion of programed homework can then be uniformly and efficiently applied to all students.

Intelligence and Typing Proficiency. Essentially zero relationships were found between general mental ability (as inferred from vocabulary test scores) and straight copy proficiency--in accord with much earlier evidence. Although correlation coefficients were depressed by restriction of range in the scores, for the low-ability students of the present investigation there was only a slight (and nonsignificant) tendency for intelligence to be correlated with production typing proficiency among C and P students. However, in eleven out of twelve instances, relationships were lower for P than for C students--in agreement with earlier findings that the greater individualization of instruction accomplished by programed instruction reduces the dependence of achievement on aptitude. [pp. 74-76]

Conclusion and Recommendation 6. There is no present evidence that intelligence is a useful partial basis for screening low-ability applicants for vocational typing training. However, the reduced dependence of achievement on aptitude following programed instruction is all to the good and argues for the widespread use of well developed programed-learning materials.

Inter- and Intratask Relationships. As mentioned earlier, straight copy proficiency is little related to production proficiency [pp. 77-78]. In addition, production speed was found to be uncorrelated with production form errors (r = .05) or with uncorrected typographical errors (r = .04) [pp. 79-80]. Correlations among production tasks (letters, table, manuscripts) ranged from low to moderate (-.11 to .62), the higher ones being found for tasks that share internal features and therefore placement processes. The range of intertask r's (for form errors) was greatly narrower for P than for C trainees. [pp. 80-81]

Conclusion and Recommendation 7. (See Conclusion and Recommendation 1, pp. 89-90.)

Conclusion and Recommendation 8. The essential independence of production speed and quality suggest that the two aspects of performance be given separate instructional attention and, depending on the reliability of speed and error measures, be separately scored.

Conclusion and Recommendation 9. To the extent that various production tasks (business letters, tables, manuscripts) share internal features and, in consequence, the procedures applicable to attractive placement on the page, economies in training time and higher proficiency may be expected to result from deliberate "teaching for transfer"--intentional pointing to task communalities and placement processes--in contrast to treating each task as unique. In the sense of greatly more consistent predictability of task performance levels among programed than among conventional students in the present investigation, transfer effects, aimed at by the programed instruction, were better achieved than by conventional instruction.

Bringing the findings of the present investigation to bear on the original problem of the widespread complaints of employers about the undersupply of typists sufficiently skilled at vocational typing tasks, the evidence seems compelling that near-reversal in conventional instructional practices may be expected to ameliorate employers' complaints. Drastic reduction in emphasis on ordinary stroking skills, early introduction of vocational typing tasks, explicit instruction in how to make placement decisions, and ample practice in applying those decisions, without teacher guidance, to realistic materials (unarranged longhand) are clearly indicated. In the present instance, the foregoing tactics were implemented via programed (self-instructional) materials dealing with placement processes. Their excellent success under disadvantageous conditions (low-ability students and teachers inexperienced with programed instruction, plus long-established expectations by both of teaching and learning via live, oral instruction) points to the usefulness of programed instruction for the objectives given above and promises even greater success among students of at least average abilities, especially upon appropriate retraining of teachers for their modified roles in support of programed instruction. Even among low-ability students, "clerical" curricula confined to typing skills of little marketable value can be replaced by typing skills desired by employers.

References

Anastasi, A. Practice and variability: a study in psychological method. Psychological Monographs, 1934, 45, No. 5.

Bancroft, T. A. Topics in intermediate statistical method, Volume I. Ames, Iowa: Iowa State University Press, 1968.

Bugelski, B.R. The psychology of learning. New York: Holt, Rinehart & Winston, 1956.

Buros, O. K. (Ed.) Sixth mental measurements yearbook. Highland Park, NJ: Gryphon Press, 1965.

Cook, W. W. and Appel, M. New bases for predicting typing success. Journal of Business Education, 1941, 16, 17-18.

McLean, G. Difficulty indices and performance norms for office typing tasks. City University of New York (Office of Teacher Education): Research Report 71-2, 1971.

Miner, J. B. Intelligence in the United States. New York: Springer Pub. Co., 1957.

Miner, J. B. On the use of a short vocabulary test to measure general intelligence. Journal of Educational Psychology, 1961, 52, 157-160.

Muhich, D. Key-stroking vs. decision-making factors in proficiency at office-typing tasks. Master's thesis, Southern Illinois University (Carbondale), 1967.

New York State plan for the administration of occupational education under the vocational education amendments of 1968. Albany: State Education Department, 1970.

Stolurow, L. M. The psychology of skills--Part II: Analysis and implications. Delta Pi Epsilon Journal, 1959, 2(3), 16-31.

Stolurow, L. M. Social impact of programed instruction: aptitudes and abilities revisited. In J. P. DeCecco, Educational technology. New York: Holt, Rinehart & Winston, 1964.

Thorndike, R. L. Two screening tests of verbal intelligence. Journal of Applied Psychology, 1942, 26, 128-135.

U. S. Bureau of Labor Statistics. Employment projections by industry and occupation, 1960-1975. Monthly Labor Review, 1963, 86, 240-248.

U. S. Department of Labor. Occupational outlook handbook, 1966-67 edition. Bulletin No. 1450. Washington, D.C.: GPO.

Vocabulary test G-T, Directions and norms. New York: Columbia University, Teachers College, Institute of Psychological Research, 1967. [Mimeo.]

West, L. J. The vocabulary of instructional materials for typewriting and stenographic training. Delta Pi Epsilon Journal, 1968, 10(3), 13-25. [See, also, Balance Sheet, 1968, 49, 340-343.]

West, L. J. Acquisition of typewriting skills. New York: Pitman, 1969.

West, L. J. Programed instruction for decision-making aspects of typing tasks. City University of New York (Office of Teacher Education): Research Report 70-2, 1970. [ERIC ED No. 042052]

Wright G. S. Summary of offerings and enrollments in high-school subjects. 1960-61 (Preliminary Report). USOE, OE-24010, June 1964.

Yates, F. The analysis of multiple classifications with unequal numbers in the different classes. Journal of the American Statistical Assocation, 1934, 29, 51.

Appendix Contents

	Pages
Supplementary table (No. 26)	100
Instructions for program use	101-102
Teacher questionnaire	103-105
Criterion (June) test instructions	106
Criterion (June) test materials*	107-112
January test materials*	112-117
December test materials	118-123
Error scoring manual	124-129

*Letter 23 was used in both January and June testing.

Table 26

Criterion Test Means of Individual Teachers

Variable	Conventional						Programed					
	A	B	C	D	E	F	A	B	C	D	E	F
Vocabulary	7.9	8.6	8.3	8.1	6.5	7.4	8.1	7.9	8.5	8.5	7.2	6.4
SC Speed*	27.7	33.0	37.8	36.7	37.2	33.0	31.0	27.6	36.9	38.5	36.7	34.9
SC Errors	6.8	7.6	8.3	8.1	6.5	7.4	8.1	7.9	8.5	8.5	7.2	6.4
No. of Tasks	5.5	4.5	5.3	6.3	6.1	5.9	5.4	4.6	5.1	4.6	5.5	5.5
Speed**												
Letter 2	68.3	84.0	67.8	71.5	67.7	78.4	105.2	113.6	73.5	84.4	88.7	90.6
Letter 17	40.5	55.0	37.7	40.2	35.1	38.2	46.1	54.7	39.7	38.5	45.3	44.5
Letter 23	--	--	--	42.8	--	61.5	64.4	85.7	51.0	53.8	67.4	59.9
Table 4	48.2	111.5	62.3	68.0	67.7	63.9	90.9	102.9	64.1	84.7	76.4	80.5
Ms. 1	72.3	92.0	58.9	56.0	61.3	75.8	75.2	92.8	65.8	74.8	72.2	68.8
Ms. 15	29.5	49.5	35.9	41.9	31.4	48.5	43.0	54.5	34.9	33.1	41.6	40.6
Total***	258.8	392.0	262.5	320.3	263.2	366.3	424.7	504.3	329.0	369.3	391.6	385.0
Form Errors												
Letter 2	10.7	10.5	7.4	5.0	8.2	8.1	4.1	3.8	3.8	3.5	3.7	4.5
Letter 17	4.5	4.7	4.0	3.2	4.5	4.6	1.8	1.5	2.2	1.5	2.5	2.7
Letter 23	--	--	--	4.0	--	3.8	2.1	2.0	1.8	1.5	1.6	2.4
Table 4	12.1	8.5	7.1	4.7	8.7	10.1	4.8	2.4	4.0	5.2	4.5	5.5
Ms. 1	11.2	9.2	10.4	7.8	10.2	9.5	8.3	4.6	5.8	4.4	4.4	5.8
Ms. 15	3.4	3.0	3.0	2.3	3.3	3.4	1.8	1.7	2.4	1.8	1.6	2.5
Total***	41.8	35.9	32.0	26.9	35.0	39.5	22.9	16.0	20.0	17.9	18.3	23.4
Typos												
Letter 2	6.6	8.0	3.8	1.5	3.8	5.7	5.0	3.8	3.9	3.6	4.3	4.1
Letter 17	3.2	3.5	2.9	1.7	2.7	3.0	2.1	2.1	1.9	2.2	1.7	2.0
Letter 23	--	--	--	4.2	--	3.6	4.5	2.8	3.3	3.4	3.7	3.6
Table 4	2.4	4.5	2.0	1.0	3.1	2.2	3.6	2.8	2.9	3.2	3.0	2.7
Ms. 1	6.2	5.2	4.7	3.6	4.2	3.7	5.7	4.2	6.5	4.4	5.6	5.4
Ms. 15	1.4	1.0	1.2	1.0	1.4	1.7	2.2	1.4	1.5	1.6	1.6	1.6
Total***	19.8	22.2	14.6	13.0	15.2	20.5	23.2	17.0	19.8	17.8	19.8	19.2
Range of Ns	13-25	2-20	21-46	2-30	9-37	6-55	47-55	34-54	40-49	43-65	41-56	50-64

*In words per minute. **In quarter minutes of completion time. ***Rounded.

How to Use These Instructional Materials

These materials are an example of what is called Programed Instruction. They are designed so that you can learn from them without the aid of a teacher and are different from ordinary textbooks.

The materials are "programed" in a series of small steps called frames. Each frame gives a bit of information. You show that you have understood the information by filling in one or more missing words in the frame. In that way, you will be paying close attention and will be taking an active role in your learning. After you have filled in the blanks, check your answers against the model answers given alongside the next frame.

A program is not a test. The frames are designed to teach you, not to trick you. You fill in blanks only to see whether you have learned the information given in the frames.

Three features of programed instruction give these materials a simple appearance:

1. The step-by-step presentation of subject matter
2. Your activity in filling in the blanks
3. The immediate checking of your answers against model answers

But it is just these three features that insure that you will learn, PROVIDED you give full attention and complete concentration to each frame. If you skim through the program in a casual way, you will not learn much.

This is what you do:

1. Read each frame carefully and fill in the blanks. Sometimes a frame will have one blank, sometimes several.
2. After you have filled in all the blanks in a frame, check your answers against the model answers shown at the left of the next frame.
    a. Your answers will usually be correct IF you have read the frame with close attention and IF you remember what you learned in earlier frames. If they are correct, go on to the next frame.
    b. If your answers are wrong, read the frame again or refer back to the earlier frame that contains the necessary information. Try to understand why your answers are wrong and why the model answers are the correct ones. In that way you will probably avoid making the same kind of mistake again. Do not erase any wrong answers you may make; instead, draw a light line through your wrong answer and fill in the correct answer above (or below or alongside) your original wrong answer. When you have made the correction, go on to the next frame.

3. Continue in this manner throughout the program:

   Read attentively
   Answer by filling in blanks
   Check your answers against the model answers
      Reconsider your answers if they were incorrect; lightly line out any wrong answer and fill in the correct one
   Continue with the next frame

Since a program is not a test, you have nothing to gain--and much to lose--if you look at the model answers in advance. Cover the model answers with a card; uncover and examine them only after you have written in your answers.

In this program each frame has one or more blanks to be filled in. Some examples of the types of fill-ins are given below. Notice that the model answer is given alongside (at the left) of the next frame.

		What You Do
	1. The day after Monday is ____________.	Write Tuesday in the blank
Tuesday	2. The first president of the U.S. was ________. (a/b/c/d) a. Thomas Jefferson b. Abraham Lincoln c. George Washington d. Woodrow Wilson	Write the letter of the correct answer in the blank--write c (for George Washington)
c	3. A week has __________ days. (how many?)	Write 7 in the blank
7	4. The number of states in the Union is ________. (48/49/50)	Select the right answer from the choices given in parentheses and write it in the blank--write 50
50		

The four most important points are these:

1. Don't just read the frames; read with close attention.
2. Remember what you learn in each frame so that you can use the information in later frames.
3. Before you fill in a blank, make sure you understand the question.
4. If an answer does not occur to you immediately, don't give up too quickly. THINK about it and try hard to supply an answer before you look at the model answer.

Programed Typewriting

Teacher's Questionnaire

Name ______________________________

1. List below the assigned (by LJW) subsections of the program that time did not permit your students to complete. [E.g., 9g, 14(28-40)]

   ________ ________ ________ ________ ________ ________

2. List below the subsections of the program completed by students, but for which time did not permit providing at least 2 class days of pertinent application practice (i.e., actual typing of materials based on the program).

   ________ ________ ________ ________ ________ ________

3. As best you can, estimate the percentage of students who had each of the attitudes toward the program given below. (The sum should be 100%.)

   Unfavorable _____ Neutral _____ Favorable _____

4. In your judgment, for what proportion of your students was the program:

   Highly suitable _____ Moderately suitable _____ Unsuitable _____

5. List below the particular subsections of the program that you consider to have been most difficult for the students. Start with the most difficult subsection and list up to 6 subsections in descending order of difficulty.

   ________ ________ ________ ________ ________ ________

6. Listed below are several possible sources of poor results of program use. Add as many more as you think are applicable. Then, to the right of each indicate (by SD, D, NS, A, SA) whether you "strongly disagree," "disagree," are "not sure", "agree," or "strongly agree" with each statement.

   a. These students, on the average, do not and will not do homework--especially for a subject like typewriting. _____

   b. The reading level of these students is, on the average, so low that they are unlikely to learn much from any material that requires reading. _____

   c. These students, in general, probably could have learned more from the typing program if it had been written more simply. _____

   d. Weakness in arithmetic is a prominent reason for students' difficulties with certain portions of the program. _____

   e. The typical student has a negative attitude toward school in general. _____

   f. _____

   g. _____

   h. _____

Teacher's Questionnaire

7. During the Spring 1970 semester, what percentage of class time was spent on activities directly related to the program and what percentage to ordinary stroking skills (e.g., daily warmup, speed and accuracy practice on ordinary prose materials, straight copy practice and test timings, number and symbol practice, etc.)? [The total should be 100%.]

   Related to the program ____ Related to stroking skill ____

8. Refer to your collection of supplementary practice materials (including those supplied by LJW) and to your lesson plans and record the number of items of each kind (as listed below) actually typed by students during the Spring 1970 semester.

   a. Ordinary business letters from longhand copy, not accompanied by a word count (ones in which the student had to make his own estimate of length). ____

   b. Business letters containing a table. ____

   c. Tables containing at least 1 column heading of more than 1 line. ____

   d. Tables in which intercolumn space was up to the student. ____

   e. Manuscripts containing at least 1 footnote. ____

   f. Connected longhand matter for which the student had to estimate length as a basis for selecting margins leading to a typed product centered both vertically and horizontally. ____

9. On how many occasions during the Spring 1970 semester did you collect, examine, score, and return to students their work on letters, tables, and mss.? [Count all such work done on any one day as one occasion.] ____

10. List below the particular placement features taught in the program that you feel are superior to those you had used formerly (e.g., vertical placement of business letters).

    a. ____ Others ____
    b. ____
    c. ____
    d. ____

11. What topics and procedures contained in the program were not in your curriculum in earlier years (e.g., fixed date line in letters, backspace method of centering tables, side-bound mss., footnotes, etc.)?

    a. ____ b. ____
    c. ____ d. ____
    e. ____ f. ____
    g. ____ h. ____

12. To what extent in your future teaching do you expect to teach topics and placement procedures contained in the program that you had not employed in your preprogram teaching years? [Check one of the blanks below.]

    To a considerable extent _____; To some extent _____; Not much _____

13. What proportion of student proficiency would you estimate is due to the program and what proportion to your live teaching. [The total should sum to 100%.]

    Program _____ Live teaching _____

14. To the best of your knowledge, what proportion of your students feel that, in future years, typewriting will be a primary skill for them, either vocationally or personally? A subsidiary or secondary skill? Of no use to them?

    Primary use _____ Secondary use _____ Little or no use _____

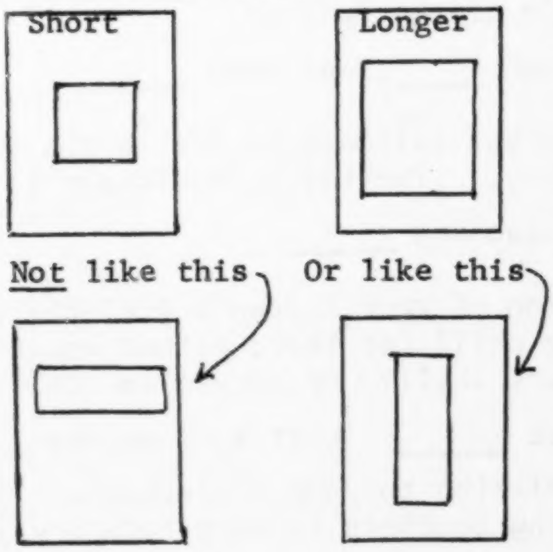
15. Rate yourself as a typewriting teacher in relation to your colleagues. [Check one and note the percentage of all typewriting teachers in each category.]

    Excellent ____, Very good ___, Average ___, Fair ___, Poor ___
    10% 20% 40% 20% 10%

16. If there are aspects of the program work not covered above that you feel are pertinent or if you wish to comment or expand on any of your earlier answers, please do so below in your own words. For example, what are your recommendations for program use? What sorts of program revisions are desirable? For what sorts of students might a revised program be applicable?

Student Test Instructions

1. A business letter should look like this:



The longer the letter, the narrower the side margins and the closer to the top of the page it should start.

Type each letter in accordance with the conventions that lead to an attractive appearance, using any acceptable letter style.

Be sure that each of your business letters has all the information required (for example, a date).

If a letter contains a table, the table should be centered horizontally; that is, the right margin should be the same as the left margin. Note the instructions in paragraph 3, below, for the way in which column headings must be typed.

2. Specific instructions for the rough draft copy are given at the top of each manuscript. If a manuscript contains a footnote, it should be typed at the bottom of the page, leaving a 1-inch bottom margin. The divider line should be 20 underscoring strokes. If the instructions state that the manuscript is to be centered both vertically and horizontally, you will have to estimate in advance how much space will be needed for the rough draft copy after all corrections are made--and place it on the page accordingly.

3. Type each table in accordance with the conventions that lead to attractive appearance, but follow the test copy exactly in determining the number of lines to use. Do not use column headings unless they are shown in the copy. Tables must be EXACTLY centered, both vertically and horizontally. Look at the table below for some other requirements. This is an example only!

		abcde		abcd
abcdefghij		abc		abcdef
abcd		abcdefghi		abc
abc	←1→	abcde	←2→	abcdefghijkl
ab		ab		abcde
abcd		abcdefg		abcdefg

Notice that the space between columns is the same; that is, distance 1 equals distance 2.

Notice, also, that each column heading is centered over its column, and each line of the column heading is centered in relation to the other line, as well as over the column. Type all tables across the 8½" width of the paper.

4. In all work, erase and correct all errors, on both originals and carbons.

DO NOT MAKE ANY MARKS ON THE TEST COPY. DO EACH TASK IN THE ORDER IN WHICH IT APPEARS IN THE TEST BOOKLET. HAND IN EACH TASK AS SOON AS YOU COMPLETE IT.

Mr. George Parks Harris
819 Frontenac Lane
Newark, New Jersey 07103

②

Dear Mr. Harris:

We have received your letter in which you ask about flights from New Orleans to Atlanta, leaving New Orleans after 6:00 p.m. We are happy to send the following:

Flight No.	Leaves New Orleans	Arrives Atlanta
6	7:45 p.m.	10:16 p.m.
4	9:23 p.m.	12:28 a.m.

There are eight regularly scheduled flights each day. A timetable showing all flights is enclosed for your additional information.

If you would like to make reservations with The Amos W. Paul Travel Agency, we shall be glad to make them for you.

Yours very truly,

Robert Torrence
Reservations Department

Enclosure: Airplane Timetable

⑰

Mrs. Jane Smith
16 Main Street
Westfield, Mass. 01085

Dear Mrs. Smith:

Stanley Home Products welcomes you!

Each dealer has at least four assets:

1. They sell a quality line of goods.
2. People have money to buy.
3. Customers like the method of merchandising.
4. Dealers like the method of selling.

Best wishes for success.

Sincerely,

C. Jay

Jackson Bakeries, Inc. – Board of Directors

Name	Occupation	City of Residence	Present Age
Howard C. Kaye	Attorney at Law	Albany	56
Albert P. Ward	Labor Arbitrator	Buffalo	48
Samuel N. Dunn	Purchasing Agent	Auburn	37
Donald G. Bell	Professor	Utica	52
James L. Wilson	Company Treasurer	New York	49
Alice E. Macon	University Dean	Rochester	40

④

Manuscript #1 Instructions: Begin 1½ inches from the top, using a 1½ inch left side margin, and a 1 inch right side margin.

Solid Caps → The Office Encounters Change

Gone is the day of the old-fashioned office where one may have found the bookkeeper at a tall desk, perched on a high stool very much resembling that reserved for the class dunce. The modern bookkeeper no longer wears a green shield over his eyes to protect him ~~them~~ from the glare of poorly shaded electric lights.

Gone, too, is the quill pen, often replaced these days by bookkeeping machines ~~and~~ computers and.[1] ← Close up to no spaces

The "note-takers"—the male secretaries of early office days—have disappeared, replaced, as we know, by the ~~efficient~~ female secretaries who are now indispensable to the businessman.

Indent first line 5 spaces; 2nd line at margin. → [1] Peter N. Mason, Automation in the Office (Newark, N. J.: Arthur Jones Co., 1966), p. 46.

Manuscript #15 Instructions: Center this copy both vertically and horizontally. You will have to estimate in advance how much space you will need, and place it on the page accordingly.

CREDIT POLICY

Paul Blake & Sons was founded on the principle of giving maximum quality and service for minimum cost.

Basic to this is the need for keeping down the cost of collections. Therefore, we have cash dealings with all our customers, with the exception of those with high credit ratings, to whom credit is extended for 7 days following receipt of the goods.

㉓

Ms. John Frederick Jackson
502 Livingstone Blvd., S.W.
Worcester, Massachusetts 01605

Dear Mr. Jackson:

We note, with regret, that you have decided to terminate your savings account with our bank. We hope that no lack of alertness or courtesy on our part has prompted your decision to withdraw. If so, we would appreciate some statement of the circumstances.

We have attempted to render a courteous and thorough service constantly and we want you to realize that your account with us has been very much appreciated. Naturally we do not want to lose a customer and we hope you will find it convenient to reinstate your account in the near future.

Very sincerely yours,

Jeffrey T. Washington
Vice-President

Type the letter below in any acceptable style; its message contains about 45 words. Use your initials as typist and the current date.

(8)

Mr. John Smith
17 Park Avenue
Worcester, Mass. 01605

Dear Mr. Smith:

In checking our guest lists, I noticed that you have not been with us since August, 1963.

I hope you enjoyed your visit, and that there were no shortcomings on our part. If, however, Pinehurst failed to accommodate you somehow, your comments will be helpful.

Sincerely,

Ed Hart

Center the table below horizontally and vertically on a full sheet. Use 8 spaces between columns.

②

Bache & Co. Bond Offerings

Cleveland, City of	5%	25 years
Detroit, City of	4%	18 years
Iowa, State of	4%	20 years
New York, School District of	5%	19 years
Pittsburgh, City of	5%	23 years

Center the table below horizontally and vertically on a full sheet. Use 5 spaces between columns.

20

Textile Remnants and Odd Lots for Clearance

Muslin	Unbleached	5 yards
Foulard	Blue, White Dots	7 yards
Worsted	Charcoal	1 bolt
Rayon	Canary Yellow	3 yards
Cashmere	Sepia	8 feet
Netting	Loose-knit, White	4 yards
Gabardine	Olive Green	2 bolts
Linen	White, Soiled	6 yards
Suede	Dark Blue	4 feet
Broadcloth	Pale Blue	9 yards
Buckram	Gray, Irregular	8 yards
Flannel	Green	1 bolt

Center the table below horizontally and vertically on a full sheet. Use 11 spaces between columns.

⑫

Greenside College Secretarial Department Program

Number	Course Title	Instructor
106	Shorthand	Baker
110	Typing	Cox
221	Filing	Gill
403	Accounting	Lee

Center the table below horizontally and vertically on a full sheet. Use 5 spaces between columns.

22

Bourne Elementary School Textbook Requisitions

Number	Author	Title	Edition
34	Strongman	How Airplanes Work	Third
29	Vincent	How Trains Work	Second
65	Kerrigan	How We Travel on Water	Second
18	Bottomley	Let's Read for Fun	Fourth
37	Kirstenburg	Adventures in Art.	First
29	Cheney	How Clothing is Made	Third
64	Carson	Travels Around the World.	Fifth

Type the letter below, arranging it attractively on the page in any acceptable style. Its body contains about 45 words. Use your initials as the typist of the letter and the current date.

Mr. J. Snow
Box 4
Troy, NY 12180

Dear Mr. Snow:

Thank you for your letter asking about the possibility of securing a sales position with our Company.

Unfortunately, we recently filled the position that was open. We shall, however, keep your resume on file should a vacancy occur some time in the future.

Sincerely,

Roy Finley
Sales Manager

Type the letter below, arranging it attractively on the page in any acceptable style. Use your initials as the typist and the current date. The body of the letter has about 115 words.

Mr. Ted Adams
64 Penn Drive
Boston, Mass. 02137

Dear Mr. Adams:

Thank you for your letter of December 8 regarding the convention of business teachers to be held in Chicago next February. I shall be glad to participate in the program.

Since there will be four speakers during the 1-hour session, I assume each speaker will be allowed 15 minutes. I plan to discuss with the audience some of this country's occupational needs during the next five years and some of the things the schools can do to help meet these needs. In the area of office occupations the demand for typists and secretaries will be especially large. Therefore, I plan to make some recommendations for improvement in training

Sincerely yours,

Robert Grant

Center the table below horizontally and vertically on a half-sheet of paper. Use 8 spaces between columns.

NEW BOOKS
Christmas Listing

Master and Commander	Patrick O'Brien	$6.95
Fire from Heaven	Mary Renault	7.95
Witchcraft at Salem	Chadwick Hansen	6.95
The Beauty Trap	Jeanne Rejaunier	5.95

Center the table below horizontally and vertically on a full sheet of paper. Use 5 spaces between columns.

OFFICE EMPLOYMENT OPPORTUNITIES

Week of December 8

Billing Clerk	$105	Mahony Agency	670-4296
Bookkeeper	145	Stanton Agency	790-1306
Cashier	110	Marvin & Griffiths	349-3800
File Clerk	110	Career Girls Agency	267-9788
Receptionist	115	Horn Agency	560-4247
Secretary	160	Franklin Agency	913-8266
Stenographer	140	Goldsmith Bros.	224-0353
Typist	115	Floyd Hanna & Co.	671-9164

Center the table below horizontally and vertically on a half-sheet of paper, using proper vertical spacing within the table. Leave 8 spaces between columns.

RECENT BOND OFFERINGS

Heavy Industry

Company	Yield	Maturity
Amalgamated Copper	9.1%	1980
Bethlehem Steel	8.6%	1986
Grace, Inc.	7.9%	1988
Western Industries	8.8%	1974

Center the table below horizontally and vertically on a full sheet of paper, using proper vertical spacing within the table. Leave 5 spaces between columns.

EVENING SESSION COURSES

Hunter College

Course	Department	Title	Professor
151	Sociology	Urban Problems	Grant
163	History	The French Revolution	Potter
175	English	Survey of English Literature	Cole
178	English	American Poetry	Deming
180	Romance Languages	Advanced Italian	Orsini
207	Psychology	Theories of Learning	Bender

Error Scoring Manual

The scoring manual applies to the scoring of the office-typing tasks for uncorrected typographical errors and form errors.

Uncorrected Typographical Errors

The following are to be considered as errors. No one word can have more than 1 error.

- Spacing:
  - two spaces between words
  - extra space within word
  - one space after a period or colon, except in enumerations
  - two spaces after a comma or semi-colon
  - omission of space between words
- Mis-strokes:
  - incorrect letter
  - transposed letters or words (count as one error only)
  - strike-over (count as one error per word)
  - capital letters not on line
  - letter not visible
- Other:
  - word or phrase repeated (count as 1 error)
  - word or phrase omitted (if omitted in succession, count the entire omission as 1 error. But if ommissions are separated, count each such omission as a separate error)
  - incorrect word division

Form Errors

Form errors differ from one class of task to another. Reference should thus be made to the particular class of task being scored. If a form error is consistently made throughout a task, it is counted the first time only, except where otherwise indicated. In addition, each error is to be counted without regard to the relationship of one error to another. For example, if a student does not center a column heading over a column, and this makes for an unequal number of spaces between columns, two errors, rather than one, would be counted.

Scoring for Tables

Table Headings

Title omitted

More or less than 2 blank lines following table heading or less than 1 blank line if table rows are single spaced

Table heading not centered horizontally (Allow a difference of 2 spaces)

Table heading underscored

Columnar Arrangement

Columns and/or rows out of order (1 error for each inversion)

Column not blocked at the left

Space between columns not the same

Less than 4 spaces between columns (except on Table #6, Pica, 3 spaces is permissible) or more than 20 spaces. (1 error for total table unless the constant column (i.e., the one used most often) is 4 or more spaces, in which case the error is counted each time it occurs)

Column Headings

More or less than 1 blank line following column headings

Column headings not exactly centered over column (if odd space, can be on either side) (count each time)

2-line heading with underscore not extending the width of the longest heading line and not typed on the bottom line

Column heading in solid caps

Column headings not underscored (count each time)

Column headings omitted (count each heading)

Vertical and Horizontal Spacing

Top margin exceeds bottom margin by more than 1 line

One side margin exceeds other side margin by more than 2 spaces

Left and right margins of less than 6 spaces, except for Table #6 if Pica type is used (count as only 1 error)

Braced Headings

Not centered exactly over the two columns (i.e., not the same number of spaces to right and left of headings braced)

(Optional)

Braced heading can be directly over column headings or can be separated by one blank line

Underscore of braced heading can be only under the braced heading or can extend over the columns that are braced

Other column headings should be on the same line as the headings that are braced, or they should be centered between the braced heading and the headings braced

Options

Table headings may be in either upper or lower case

Tables may be either on whole sheets or half sheets, but must be centered

If a wrong word is used, count as a typographical error

Miscellaneous

Table typed on onion skin rather than on bond paper

Hole in paper from erasing

Short table single spaced; single or double spacing option on others

Spacing of more than double in short tables

Carbon copy typed

Omitted line

Unnecessary part

Scoring for Letters

Paper Usage

Original typed on onionskin rather than on bond paper

Carbon copy not typed

Hole in paper from erasing

Carbon copy typed on back of original

Carbon copy typed on bond paper

Vertical and Horizontal Spacing

Top margin should equal bottom margin (Allow a difference of up to 6 lines)

Letter not wquarely placed on the page, i.e., crooked

Initials following Enclosure notation

Writing line width should be:

	Pica	Elite
Short letter	40-50	50-60
Long letter	50-60	60-70

Right margin should be equal to left or narrower, but not by more than 1/2 inch

Enumerations

Enumerations may be blocked under wording or at left margin

Enumerations not separated from paragraphs by a blank line

Table Within Letter

Table must follow rules for scoring tables

Table not centered WITHIN the letter

Unequal space above and below a table

Miscellaneous

Omitted line
(one error per line)

Internal Spacing

Letter not single spaced, except for a short letter, which must then use indented paragraphs

Less than 3 blank lines between date and inside address

More or less than 1 blank line between inside address and salutation

More or less than 1 blank line between salutation and body

More or less than 1 blank line between paragraphs

More or less than 1 blank line between body and complimentary close

Less than 3 lines or more than 6 blank lines between complimentary close and typed signature

Blank line between typed signature and title

More or less than 2-3 spaces before ZIP Code

Initials above signature line or more than 4 lines below

Letter Parts

Complimentary closing omitted

Signature line omitted

Initials omitted

Date omitted

Options

Date may be centered, start at center, start at left margin, or end at right margin, depending on letter style used. Any other options are incorrect.

Enumerations may have 1 or 2 spaces following the number, but spacing must be consistent.

Complimentary close and signature line should start at center or left margin, depending on letter style used. (one error each)

Enumerations may be indented

Scoring for Manuscripts

Title

Title omitted

More or less than 2 blank lines following title

Title not centered horizontally (Allow a difference of 2 spaces)

Title underscored

Titles typed in upper case where copy is lower case, or titles typed in lower case where copy is upper case

Internal Spacing

Manuscript single spaced or more than double spaced

More than a couble space between paragraphs

Paragraphs not indented a uniform number of spaces (5, 7, or 10)

Less than or more than 2 blank lines between paragraph end and next side heading

Vertical and Horizontal Spacing

CENTERING: Must follow instruction at top of copy

If centering indicated

Top margin ≠ bottom margin (Allow 1-line difference)

Left and right margins less than 6 spaces each

Left margin ≠ right margin (Allow 2-space difference)

If specific instructions given

Top margin less than or greater than 8-9 lines deep

Left margin not: 14-16 (Pica)
17-19 (Elite)

Right margin not: 9-11 (Pica)
11-13 (Elite)

(Determine right margin by the point at which the majority of full lines end, i.e., line of best fit.)

Vertical and Horizontal Spacing
(Continued)

If specific instructions given
(Continued)

One line that is short of line of best fit or extends beyond line of best fit by more than 6 spaces

Footnotes

Period after footnote notation

Footnote sign in body not raised ½ line

Footnote sign in body with space separating it from the preceding word

Divider line omitted

Divider line not straight

Divider line less than 10 or more than 25 strokes long

More or less than 1 blank line after divider line

If footnotes used, bottom margin less than or greater than 1"-1½" (i.e., 6-9 lines)

1 Footnote omitted	6 errors
2 Footnotes omitted	10 errors
1 of 2 Footnotes omitted	4 errors

(Above error count based on number of potential errors if footnote(s) typed.)

Miscellaneous

Draft typed on onionskin rather than on bond paper

Carbon copy typed

Hole in paper from erasing

Manuscript must be on full sheet

Unnecessary parts typed

Omitted line (one error per line)

Indicated correction not made

Options

If initials are used in the copy, either alternative (i.e., space or no space between initials) is acceptable.